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ABSTRACT

This package includes compaction plans, enrichment opportunities designed to be substituted for the basic science curriculum already mastered, and extensive bibliographies of materials and books for gifted students in the Orono (Minnesota) school district. The project focused on training seven science teachers for cluster teaching of students gifted in science in grades 4-8. The teachers received training in principles of curriculum differentiation, compaction and modification, as well as the current literature and characteristics of gifted science students. The implemented programs yielded increased teacher motivation, increased classroom interest and student participation, refinement and articulation of the Orono science curriculum, and a more supportive administrative stance toward the curriculum. Charts include enrichment activity matrices covering processes of comprehension, application/analysis, and synthesis/evaluation for several topics of study, and bibliographies by grade and topic. (PB)

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The Orono Science Project

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Enriched Science for Gifted Cluster Students

EC 221309

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The Orono Science Project

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The Orono Science Project

In the spring of 1987, the Orono school district, a small western suburb of Minneapolis, Minnesota, received a competitive Title II grant for a demonstration and exemplary program entitled, "Training Teachers of Science for Cluster Teaching of Gifted Students." The grant was designated for training seven teachers in grades 4-8 to educate students gifted in science. Instructional writing time was also included in grant funding.

The program of training/writing/implementation occurred during the period, May, 1987-May, 1988. Three initial training days were spent on: (1) assessment of the current science program in the Orono District; (2) characteristics of an "exemplary" science program (review of current literature); (3) characteristics of a gifted science student; (4) principles of curriculum differentiation; (5) procedures for curriculum compaction; (6) procedures for modifying curriculum; and (7) procedures for developing new instructional units in science. This comprehensive training was facilitated by Karen B. Rogers, Assistant Professor of Gifted Studies, at College of St. Thomas.

During the summer of 1987, the teachers were allocated five writing days each, in which to prepare instructional activities for their 1987-1988 classes. During the ensuing school year, Karen Rogers continued to work with the teachers in the development and revision of their instructional writing. Each teacher was expected to compact and modify at least three of the science topics normally taught in the year. Meanwhile, the school district scheduled these teachers' classes, such that the highly talented science students would be clustered together in at least one period per day with the teachers involved in the project.

During the 1987-1988 school year, the teachers began implementation of their modified instructional units. The group met three times, once each trimester, with Karen Rogers, to discuss implementation efforts, to revise those enrichment activities which had not been successfully implemented, and to continue writing instructional enrichment for more of their science topics.

The results of this year of extensive training, writing, and implementation can be categorized as follows: (1) changes in teacher attitudes; (2) changes in gifted students' attitudes toward science; (3) changes in the Orono science curriculum; and (4) changes in administrative stance toward the Orono science curriculum.

Changes in Teacher Attitudes

The teachers involved in this project were longstanding district employees, two of whom were near retirement. By their own admittance, several of the teachers described themselves as pretty "fixed" in what and how they taught students in science. Much of the training was initially met with concern about whether or not such ideas would really work in their classrooms, but they agreed to "experiment" with at least three modified instructional units before discarding the ideas and principles presented in training. The biggest initial concern dealt with allowing these students to work on enriched science activities without constant teacher supervision.

These concerns proved groundless, once implementation was undertaken. Teachers reported surprise and pleasure in the increased motivation they experienced with students participating. The units written were soon introduced not only in the designated "cluster" class, but also in the teachers' other science classes in the middle school (grades 6-8).

Compaction was the key factor in this widespread implementation. Many of the teachers at these levels had experienced students who had already grasped the concepts they planned to teach. Each teacher found that by developing a compaction plan to which all classroom participants could apply, several students in each class could be involved in the enrichment. For these teachers, it is believed that having so many students involved in one or another units contributed to their feelings that they were benefitting many more students than gifted students alone. This, in turn, undoubtedly motivated the teachers to continue with the compaction/enrichment modification of all their science topics for the year. The principals of the intermediate (grades 4-5) and middle (grades 6-8) schools both remarked on the increasingly positive, motivated attitudes of the teacher participants toward their students and their own teaching. During May, 1988, moreover, the seven teachers made a presentation of the Orono Board of Education requesting district funding to continue with the development of enriched instruction in science and were funded for the 1988-1989 year.

Changes in Student Attitudes

The Orono teachers reported increased classroom interest and student participation in science. Many of the teachers expressed surprise at this occurrence because they had always provided enrichment opportunities for gifted students, but had had very few takers. In the upper grades particularly, the teachers reported that the students had "changed" from reluctance to participate in enrichment activities to wanting to know what the next enrichment activities would be like. Two of the teachers had to prepare large charts before each new topic began so that students could begin deciding what they would do next. The teachers attributed this to the psychological success of "compaction." It was felt that these students thought they were getting out of work when they were allowed to test out or demonstrated competence on a topic; this, in turn, spurred them to undertake the enrichment, which they perceived as fun, not dry content.

A second change reported by teachers was the increased self-direction of student participants. As one teacher stated, "These kids can do a lot more on their own than I ever expected." In general, the students used their unsupervised time to work on projects wisely. Evaluation of the projects by the students themselves and their teachers confirmed that the projects were completed in a timely and high quality manner.

Changes in the Science Curriculum

The initial needs assessment conducted by the teachers involved in the project resulted in the identification of several duplications of science content in succeeding grades. In the case of the fourth and fifth grades, it was discovered that a daily offering of science content across all classrooms was not ensured. Thus, these overlaps and deficiencies provided the rationale for revising the science topics and projects offered for each of the grade levels involved. The teachers (n=4) of the fourth and fifth grades were able to convince the others at those levels to allow science to be offered each day; in fact, the teachers either did the science teaching for other classrooms or shared their enriched activities with those colleagues who wished to do it themselves. In the upper three grades, the teachers managed to develop appropriate enrichment for each of the science topics they taught, once the few duplications in content were eliminated. There is no question that the general science curriculum is in better shape and more articulated than it was before the beginning of the project.

Changes in Administrative Stance

As previously mentioned, the district continues to fund the participating teachers' writing and revision time for the next school year. The district media specialist was encouraged to help in the development of a grant application to the National Science Foundation to update the science and technological holdings of the district. No substantial additions had been made to the district library and resource center since 1970, a deficiency quickly discovered by the teachers and their students as they sought science information for the enrichment projects.

The teachers were also encouraged to present future science needs to the Board of Education at the end of the second year of funding. At the present time, the district is attempting to find funds to establish a science resource center, staffed full-time by one of the science teachers, to help students across all grade levels pursue enrichment projects. There is every reason to believe this center will soon be a reality.

In the pages to follow, the reader will find the compaction plans, the enrichment opportunities designed to be substituted for the basic science curriculum already mastered, and extensive bibliographies of materials and books for students to use in the pursuit of the described enrichment projects.

Contributors to this Project

Vernon Linn	Grade 8
George Johnson	Grade 7
Jan Jacobsen	Grade 6
Terry Lambert	Grade 4
Ron Nelson	Grade 5
Herb Carruthers	Grade 5
Warren Nelson, Principal	
Karen B. Rogers, Editor	

Orono
Intermediate School

Science Enrichment
Activities

ENRICHMENT ACTIVITY MATRIX

TOPIC: Watching the Sky **TEACHERS:** **SCHOOL:** Orono Intermediate School **GRADE:**

CONTENT		
1. Stars & Constellations	1. Pick a constellation. Find out everything you can about it. Share with the class. 3. Make up a constellation. Write a story about its origin and illustrate it.	2. Looking at a star chart, rename ten constellations. Explain reasons for the new names you choose. 4. Visit the Minneapolis planetarium and report to the class. Include what you liked and disliked.
2. Sun	1. Design a poster illustrating star magnitude and share with class. 3. Make a model of a sundial using Activity Sheet 38.	2. Develop and experiment to show comparisons of sun's energy using solar prints. 4. Explain and demonstrate a radiometer to the class.
3. Planets	1. Pick a planet. Find out everything you can about it. Share with the class. 3. Read five issues of Odyssey and do a project from one.	2. Make up your own mnemonic helper for learning the order of the planets. 4. Recommend and describe three projects from Odyssey magazine to the class.
4. Moon	1. Read the book, The Moon Jack and Jill and answer worksheet questions. 3. Demonstrate what causes an eclipse.	2. Make a calendar to show phases of the moon. 4. Make a space station for the moon. Explain what problems you would have to solve.
5. Telescope	1. Find an experiment to demonstrate how a lens works. 3. Research telescopes. Make a map of world locations.	2. List the ways lenses are used in your life. 4. Make a telescope. What would you need to do to see far into space with your telescope.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Animals **TEACHERS:** **SCHOOL:** **GRADE:**

CONTENT		
1. Dinosaurs	1. Record and organize data from class fossil projects. Draw conclusions for group presentation.	2. Make a clay model of a dinosaur.
2. Adaptations	1. Choose animals that adapt to cold weather in winter. Display your information on a poster and share with class.	2. Using as a model, Rudyard Kipling's "How the animal got its _________," write and illustrate a similar story.
3. Protection	1. Find information about how animals protect themselves not described in class and tell class.	2. What animal am I? Use protection and vulnerability facts. Make a matching quiz for the class.
4. People Protect Animals		2. Make a list of Minnesota's Endangered Species, and report on one of them.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Plants and Animals **TEACHERS:** **SCHOOL:** Orono Intermediate School **GRADE:**

1. How are animals and plants dependent on one another? Design a poster illustrating a food chain.	2. How important is light to plant growth? Do an experiment to show how light affects plants.	3. How important is water to plant growth? Develop an experiment to show that plants need water.
4. How does food get from the farmer to the consumer/ Design a map or path showing the path food takes from farmers to consumers.	5. How are animals in a single class similar and different? Study the habits of spiders in action.	6. How can you classify mammals according to categories you create? Create you own classification system.
7. How was our current classification system invented? What influenced its development? Write and perform a short skit.	8. What would happen if an insect destroyed all the wheat? Write a short report, story, or skit to show what would happen.	9. What is an unusual plant or animal that most Americans do not eat? Share an exotic dish with the class.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Electricity **TEACHERS:** **SCHOOL:** Orono Intermediate School **GRADE:**

1. What events in history led to our present use of electricity? Make a time line illustrating historical events in the relationship of man to electricity.	2. How does the telegraph work? Make a model and demonstrate the sending of a message via telegraph. Describe how the telegraph affected westward movement of the American pioneers.	3. How do societies without electrical resources function differently from ours? Write a skit or story depicting the ways that society functions without electricity.
4. How is electricity produced and how does it get to your house? Make a poster or panorama to present to the class.	5. Apartment house wiring. A house has 4 rooms. Each has a light and switch. Each room's light can be controlled by its occupant. A master switch in the basement controls the electrical flow to all rooms. Can you design a circuit to do this?	6. How is electricity bought and sold? Learn about the buying and selling of electricity. Present your findings in a report.
7. How can you put electricity and magnetism to work for you in the form of an alarm? Make an alarm of your choice with a drawing of the circuit and an explanation of the way it works. Examples: door or rain alarm.	8. What foods in combination with metals have the capability of producing electricity? Design an experiment to test the ability of different foods to produce electricity.	9. How can we demonstrate the presence of static electricity? Gather several experiments to demonstrate static electricity. Find out how lightning is related. Share your findings with the class.

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Time Line of Events - Activity #1

Record dates and the importance of the events and discoveries which contributed to electricity development.

537 See	Seeman, Bernard. STORY OF ELECTRICITY AND MAGNETISM. Electricity Development: Chapter 1
537.072 Sto	Stone, A. Harris. TURNED ON
621.381 Ben	Bendick, Jeanne. ELECTRONICS FOR YOUNG PEOPLE. Electricity development: Chapter 4 and 5

Telegraph - Activity #2

How did the telegraph affect the westward movement of pioneers in the United States?

383 Rei	Reinfeld, Fred. PONY EXPRESS Telegraph: Chapter 11
384 Nea	Neal, Harry Edward. COMMUNICATION; From Stone Age to Space Age. Telegraph: pp. 142-3
384.1 Aul	Ault, Phil. WIRES WEST
384.09 Bat	Batchelor, Julie Forsyth. COMMUNICATION: From Cave Writing to Television. Telegraph: Chapter 5

Activity #2 continued

384.09 Fos	Foster, G. Allen. COMMUNICATION: From Primitive Tom-toms to Telstar. Telegraph: Chapter 5
973 Nat	National Geographic Society. WE AMERICANS. Telegraph: p. 181
921 Hay	Hays, Wilma Ritchford. SAMUEL MORSE AND THE ELECTRONIC AGE. Telegraph: pp. 98-99
McG	McGriffin, Lee. A COAT FOR PRIVATE PATRICK

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Non-Electrical Societies - Activity #3

How do societies without electrical resources function differently from ours? Students should read about life in pre-electric or non-electric culture.

Ancient Times

913.37 Cow	Cowell, F.R. EVERYDAY LIFE IN ANCIENT ROME
913.38 Que	Quennell, Marjorie. EVERYDAY THINGS IN ANCIENT GREECE
913.38 Rob	Robinson, C.E.. EVERYDAY LIFE IN ANCIENT GREECE

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728.8 Mac	Macaulay, David. CASTLE
914 Row	Rowling, Marjorie. EVERYDAY LIFE IN MEDIEVAL TIMES
940.1 Bee	Beech, George. A WORLD UNTO ITSELF; LIFE IN A MEDIEVAL VILLAGE
940.1 Bla	Black, Irma Simonton. CASTLE, ABBEY AND TOWN
940.1 Sob	Sobol, Donald J. THE FIRST BOOK OF MEDIEVAL MAN

Activity #3 continued

Early Days in Our Country

305.2 Kal	Kalman, Bobbie. EARLY SETTLER CHILDREN
306.8 Kal	Kalman, Bobbie. THE EARLY FAMILY HOME
307.7 Kal	Kalman, Bobbie. EARLY VILLAGE LIFE
307.7 Kal	Kalman, Bobbie. EARLY CITY LIFE
370 Loe	Loeper, John J. GOING TO SCHOOL IN 1776
381 Kal	Kalman, Bobbie. EARLY STORES AND MARKETS
640 Fis	Fisher, Leonard E. THE HOMEMAKERS
745 Tun	Tunis, Edwin. COLONIAL CRAFTSMEN AND THE BEGINNINGS OF AMERICAN INDUSTRY
790.0973 Kal	Kalman, Bobbie. EARLY PLEASURES AND PASTIMES
917.3 Ear	Earle, Alice M. CHILD LIFE IN COLONIAL DAYS

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917.3 Farquhar, Margaret C. COLONIAL LIFE IN AMERICA
Far

917.3 Hilton, Suzanne. THE WAY IT WAS - 1876
Hil

917.3 Sloane, Eric. ABC BOOK OF EARLY AMERICANA
Slo

917.3 Tunis, Edwin. COLONIAL LIVING
Tun

917.3 Tunis, Edwin. FRONTIER LIVING
Tun

917.3 Tunis, Edwin. YOUNG UNITED STATES 1783-1830
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917.3 Wright, Louis B. EVERYDAY LIFE IN COLONIAL AMERICA
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917.32 Speare, Elizabeth George. LIFE IN COLONIAL AMERICA
Spe

917.49 Tunis, Edwin. THE TAVERN AT THE FERRY
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973.2 McGovern, Ann. IF YOU LIVED IN COLONIAL TIMES
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973.2 McGovern, Ann. IF YOU SAILED ON THE MAYFLOWER
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921 Sloane, Eric. DIARY OF AN EARLY AMERICAN BOY
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Activity #3 continued

973.2 Rich, Louise Dickinson. THE FIRST BOOK OF THE EARLY SETTLERS
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745.5 Purdy, Susan. ESKIMOS
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970.1 Leavitt, Jerome. AMERICA AND ITS INDIANS
Lea

970.1 May, Julian. BEFORE THE INDIANS
May

Activity #3 continued

970.1 McN	McNeer, May. THE AMERICAN INDIAN STORY
970.1 Sut	Sutton, Felix. THE HOW AND WHY WONDER BOOK OF NORTH AMERICAN INDIANS
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970.3 McG	McGovern, Ann. IF YOU LIVED WITH THE SIOUX
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572 Per	Perkins, Carol. "I SAW YOU FROM AFAR"
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What causes lightning?

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551.5 Bendick, Jeanne. LIGHTNING
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551.5 Hellman, Hal. LIGHT AND ELECTRICITY IN THE ATMOSPHERE
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Zim

551.59 Tannehill, Ivan Ray. ALL ABOUT THE WEATHER
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537 Epstein, Sam. ELECTRICITY
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537 Feravolo, Rocco V. JUNIOR SCIENCE BOOK OF ELECTRICITY
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537 Morgan, Alfred. FIRST ELECTRICAL BOOK FOR BOYS
Mor Static Electricity: Chapter 1

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FICTION:

Law	Lawson, Robert. BEN AND ME; A NEW AND ASTONISHING LIFE OF BENJAMIN FRANKLIN AS WRITTEN BY HIS GOOD MOUSE, AMOS.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Health **TEACHERS:** **SCHOOL:** Orono Intermediate School **GRADE:**

CONTENT			
Variety	1 How does the cardiovascular system work? Write a skit or puppet show that depicts the parts and functions of the cardiovascular system. If possible, perform it for the class or make a video to show to the class.	2 Find out why people choose to smoke even when they know it's harmful to them. Find out some of the chemicals in cigarette smoke and the damage to the body from these chemicals. Make a smoking machine.	3 How do lungs work? Make and demonstrate a model lung. Explain how it works relating your product to the human body.
Study of People	4 What are common problems 5th grade students experience in relationships? Analyze problems students have with relationships. Write an advice column (i.e., Dear Abby style) to offer solutions to these problems.	5 What is a transplant? What can be transplanted? Research transplants. What are some problems with transplantation? Share your finding with the class in an oral or written form.	6 Investigate a pioneer in medical science such as William Harvey, Louis Pasteur, David Ferrier or William Beaumont. Make a poster, timeline, or a report to show with the class.
Reading & Literature	7 How does growing up affect a person's emotions? Read What Makes Me Feel This Way? by Eda LeShan. Choose 2 or 3 feelings you found most interesting and share this information with the class.	8 Imagine you have had a brain transplant. Write a story about your experience. You must do #5 first or research transplants before doing this.	

ENRICHMENT ACTIVITY MATRIX

TOPIC: History of Flight **TEACHERS:** **SCHOOL:** Orono Intermediate School **GRADE:**

CONTENT			
Complexity	1 Design a plane of the future. Be sure to put in all details and be prepared to share your design and how your plane will work in terms of the forces of flight.	2 Prepare an oral report on breaking the sound barrier. Include in your report who did it, what aircraft was used, and a brief history of the problems associated with this obstacle.	3 Investigate what a gyroscope is and its relationship to flight. Demonstrate how one works and explain the principles involved.
Study of People	4 Read a passage from Antoine Saint Exupery's Wind, Sand, and Stars. Compose a poem or prose passage about an imaginary flight.	5 Investigate the problems associated with air flight. Write a report on one problem of your choosing and include future directions being taken. HINT: noise pollution, overcrowding of the skies, air pollution, pilot error.	6 Make a model of a kite used by the Chinese. Be prepared to explain about the importance of kites to this culture.
Economy	7 Make a chart showing the time needed to cross the Atlantic from the Vikings to the present.	8 Using the information from your chart, write a report on "Our Shrinking World." Discuss the impact on communications.	9 Given a bag of weights, construct a mobile that illustrates highlights in the history of flight. Consider center of gravity when assembling the mobile.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Products **TEACHERS:** **SCHOOL:** Orono Intermediate School **GRADE:**

CONTENT	PROCESS I	PROCESS II	PROCESS III	PROCESS IV
Unit 3 Work and Machines	Show work of Rube Goldberg. Make up a picture story about a person who builds a new machine called The Great Duzzitall. What does it do? How does it work? How big is this machine? How much does it cost? Read or tell your story to your class. A	Teacher Guide to Lego Technics, pp. 42-43. Build Lego models of transportation for air, water, and land, e.g., helicopter, go-cart, ship. OR Using a variety of materials, design and make a land vehicle propelled by a single rubber band. You may use the following activity cards for inspiration: #4, 8, 10, 12, 19, 20. Test your vehicle against others. Which one goes the greatest distance? B	Plan a journey from school to Minneapolis. Draw a simple map of the route. List three or more different methods of transportation to get there. Find out the cost of these methods of transportation. Tabulate your information. See example. C	
Unit 4 Solids, Liquids, Gases	Extend and chart experiment on p. 165 in test. Compare heats needed for melting. D	Using different solids and liquids, discover and explain what happens. See example. Display results. E	After colored solutions ESS unit, do similar experiments using five common household liquids and construct a liquid sandwich. Do not drink! F	
Unit 5 Air and Weather	After reading p. 239 in text, find other weather sayings from Almanac or other sources, write down, interpret their content, decide if it is true, and report findings to class. G	Collect three or more true disaster stories from friends. Present to class. Use guided imagery. Possibly dramatize. Think of prevention. H	Keep a month-long cloud calendar. How accurately did clouds predict weather? I	
Unit 6 Watching the Sky	Where in the universe would you go to have four birthdays? How to hold a crocodile? The Diagram Group, p. 52. J	If you had seen these constellations first, what would you have named them? Give background and reasoning. Text, p. 248 Star Chart. K	Find out why the North Star does not seem to move. Share your conclusions. Use reasoning. L	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Plants

TEACHERS:

SCHOOL: Orono Intermediate School **GRADE:**

CONTENT	PROCESS I COMPREHENSION	PROCESS II APPLICATION/ANALYSIS	PROCESS III SYNTHESIS/EVALUATION	PROCESS IV
Population graph of tree count.	1. Use information collected and recorded from Wolsfeld woods hike and Nature Study Area to make graphs of maple population age and size. Use "Master or Alpha Chart*" computer program to compile information. * Spectral Graphics A	2. Using observations, predict the Maple tree population for the Nature Study Area in 10 more years, 100 more years. Are there any trees headed for the Guiness book of World Records. B	3. Compare the similarities and differences between the three sizes of Wolsfeld and the Nature area. Use charts and make presentation. C	
History of Wolsfeld.	1. Collect information. Research history. Sources: West Henepin Museum DNR Share with class. D	2. Work with Bob Gasch to dramatize history of area and Wolsfeld family. Write their own script, or extend dramatization of something Bob touches on or doesn't include. Dramatize maple sugaring process. Laura Ingalls Wilder. E	3. Discuss the value of the woods to the Woldsfeld family and to the economic structure of that time. F	
Controversy over scientific and natural (SNA) areas and developers.	1. Formulate questions and interview homeowners around wood to assess opinions concerning current usage of the woods. Interview an SNA representative for current and future plans for the woods. G	2. Compare the similarities and difference of Wolsfeld Woods to Baker Park. Write a list or given an oral report. H	3. Debate the issue of development vs. conservation of the woods in current times. Omnibus: differences of opinion. Use related news articles. I	
Luther Burbank George Carver.				

ENRICHMENT ACTIVITY MATRIX

TOPIC: Animals - Unit 2 **TEACHERS:** **SCHOOL:** Orono Intermediate School **GRADE:**

CONTENT	PROCESS I COMPREHENSION	PROCESS II APPLICATION/ANALYSIS	PROCESS III SYNTHESIS/EVALUATION	PROCESS IV
Categorize	Why do animals need to move? Brainstorm. Animal movements-using animal cards-develop a list of different kinds of movements (minimum of 5). Name an animal that would be a common example of each movement. Read and compare list with Ranger Rick's Nature Scope, p. 38-9, material attached. Lead movement game with class. A	Bone restructuring activity, p. 95 Label bones (back bone, leg bone, etc.) Be able to relate use to structure. Use ESS Bones. B	3. Compare the similarities and differences between thre three sizes of Wolsfeld and the Nature area. Use charts and make presentation. C	
Curiosity	For the record p. 6&7, Ranger Rick's Nature Scope copy, material attached. Choose activities from Can you beat the best? and share with class. (Syn/applic.) Animal movements: Have children draw cartoon animals participating in an animal field day as a human would do it. i.e., Kangaroo/high jump Frog/long jump Cheetah/100 meter dash Visualization, imagination,originality. D	Having Fun With Science, p. 95. Extend. What animal am I? and Animal Safari. Use animals not found in text. Use Book of Little Known Far Out Facts and other resources. Make up five "What animal am I?" riddles and five Animal Safari sentences. E	Design an experiment using mealworms, goldfish's praying matis, or brine shrimp like the experiment on page 81 in your text (but not the same). Human Society. F	
Complexity	Make a list of library books on animal fiction. Read one, evaluate, recommend to class orally. G	Research the following: How was the MN environment altered for the species staying there? Why does MN have two zoos? From what source or sources does each zoo get its money? H	After reading Ranger Rick's Nature Scope, "Mammals in Our Lives", choose one and research a problem facing an animal in MN: whitetail deer, beaver, wolves, bluebirds, carp, eagles, whooping cranes, swans, osprey, peregrin falcon, others. Paradox/Intuitive expression Ranger Rick Minnesota Volunteer I	

Orono Middle School

Science Enrichment Activities

ENRICHMENT ACTIVITY MATRIX

TOPIC: Outdoor Education (Nature Center) **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
1. Study of "Life In A Hollow Log"	Visual display of "Life in a Hollow Log."	Choose 18 topics. Research each species. Use list provided - you must choose 6 from each list.	Oral presentation Collection of pictures of 18 species chosen.	
	Arrange with naturalist a field trip. Interview naturalist. Arrange for naturalist to speak to class.		Bulletin Board display charts posters	
		What qualifications are needed to be a naturalist? What is included in their job? What parts of their job do you like? Dislike?	Introduce naturalist to class Hand in written material on each topic Learn at least 3 interesting facts about each of 18 species in Hollow Log.	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Outdoor Education **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Study of fossils, Dandelion, Poison Ivy, Poison Oak, Greenhead Fly, African Goliath Beetle, Bats, Carnivorous plants, Peregrine Falcon, Tumbleweed	Display on bulletin Board topics (in content) or as mobile, puzzle, video.	Research: collect and record information to answer questions and find more facts on list of 12.	Share information with class. Show video and or film strip.	
Rolling Weed, Capybara, Snag, Horned Owl, Ginkego Tree, Photosynthesis, Shrike, Salamander, Praying Mantis, Spiders, Leaf-cutting ant, Honeybee, Vulture, Camouflage (animal and insect).	Locate at least 5 sources and make a bibliography card for each one. Research for information besides questions already on unit.	Record information on cards. Make a bibliography card. Use many (5) sources. Describe animal or insect adapation, how do they fit food web, and what do they eat.	Mobile Slides Picture collection Poster display Diorama (showing animal in natural habitat. Demonstration (puppet show)	
Choose topic: You must do 12 that are approved by your teacher.	Books, TV, video tapes, film strips, pamphlets Science World, Current Science, Periodicals. Arrange for a naturalist to give presentation to class.	Information about reproduction, mating habits, care of young. Make yourself comfortable with all types of resource materials.	Introduce naturalist to class. Tell area or topics they will talk on.	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Living Things **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 1 (page 5) Living Things	Comparison - How pets respond to various situations. 1. to student 2. when reprimanded 3. compare responses for different kinds of animals (Chart results) Have students use dictionary to find different meanings of term, cell? How are meanings similar? Plant pigments are used in dyes and paints - Find out about pigments that are used in such materials, the color they give, uses for paint and dyes containing such pigments.	Look at head of a pin - measure the diameter of the head. Explain why some body cells are so small. How many could fit on head of a pin? Find out about causes, symptoms and treatments for bacterial diseases such as pneumonia, strep throat, tuberculosis, and diptheria.	Panel discussion on organ transplants such as kidney, lung, or heart transplants. Problems involved: rejection, donors, success of operations. Write story about a body system that goes on strike. Include the problems to the body and other systems caused by the strike.	Bulletin Board

GRADE SIX CLUSTER BIBLIOGRAPHY

LIVING THINGS

Ref 423 Web	WEBSTER'S THIRD NEW INTERANTIONAL DICTIONARY OF THE ENGLISH LANGUAGE; UNABRIDGED. (Find different meanings of the term "cell.")
Ref 500 New	THE NEW BOOK OF POPULAR SCIENCE Dyes: Vol. 6:270
Ref 500.7 Med	MEDICAL SCIENCE (Social Issues resources Series, Inc.) Transplantation of organs: check the index (in front of looseleaf binder)
Ref 610 Mil	Miller, Benjamin F. THE COMPLETE MEDICAL GUIDE Check the index under names of specific bacterial diseases
Ref 610.3 New	THE NEW ILLUSTRATED MEDICAL AND HEALTH ENCYCLOPEDIA Look up the name of the individual bacterial disease
Ref 612 Rot	Rothenberg, Robert D. DISNEY'S GROWING UP HEALTHY See the following volumes: Our Illnesses. What Goes On Inside Us
Ref 618.9 Chi	CHILD HEALTH ENCYCLOPEDIA. Check the table of contents for names of bacterial diseases (pp. XVIII-XX)
Ref 636.7 Dan	Dangerfield, Stanley. THE INTERNATIONAL ENCYLOPEDIA OF DOGS
Ref 636.7 Joh	Johnson, Norman H. THE COMPLETE PUPPY AND DOG BOOK
362.7 Kuk	Kuklin, Susan. MINE FOR A YEAR (PETS)
535 Adl	Adler, Irving. COLOR IN YOUR LIFE (Pigments)
535 Hea	Healey, Frederick. LIGHT AND COLOR (Pigments)
535 Nea	Neal, Charles D. EXPLORING LIGHT AND COLOR (Pigments)
535 Rai	Rainwater, Clarence. LIGHT AND COLOR (Pigments: 87, 106, 110, 118, 137-139)
535.6 Pas	Paschel, Herbert P. THE FIRST BOOK OF COLOR (Pigments)
570 Chi	Chinery, Michael. BREEDING AND GROWING; FOUNDATIONS OF GENETICS, ANTHROPOLOGY, AND AGRICULTURE. (Cells)
574 Asi	Asimov, Isaac. THE GENETIC CODE (cells)
574 Pfe	Pfeiffer, John. THE CELL
574.8 Kel	Kelly, Patricia M. THE MIGHTY HUMAN CELL
574.8 Sch	Schneider, Leo. YOU AND YOUR CELLS

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581.6 Sch	Schery, Robert W. PLANTS FOR MAN Dyes: pp. 238-245
591 Cas	Case, Marshal T. LOOK WHAT I FOUND! (PETS)
611 Asi	Asimov, Isaac. THE HUMAN BODY: ITS STRUCTURE AND OPERATION
611 Gol	Goldberg, Kathy E. THE SKELETON, FANTASTIC FRAMEWORK
611 Gol	Goldsmith, Ilse. HUMAN ANATOMY FOR CHILDREN
611 Sam	Samachson, Joseph. THE ARMOR WITHIN US
611 Wea	Weart, Edith, Lucie. THE STORY OF YOUR BONES
611 Tur	Turner, Eloise Fain. INSIDE YOU AND ME: A CHILD'S INTRODUCTION TO THE HUMAN BODY
612 Adl	Adler, Irrving. YOUR EARS
612 Adl	Adler, Irving. YOUR EYES (BODY SYSTEMS)
612 Ben	Bendick, Jeanne. THE HUMAN SENSES
612 Bib	Bibbly, Cyril. YOUR BODY AND HOW IT WORKS
612 Col	Collins, Barbara J. EXPLORING AND UNDERSTANDING THE HUMAN BODY
612 Cos	Cosgrove, Margaret L. WONDERS OF YOUR SENSES
612 Dav	Davis, Goode P. THE HEART, THE LIVING PUMP
612 Fin	Fincher, Jack. THE BRAIN, MYSTERY OF MATTER AND MIND
612 Gil	Gilmour, Ann. UNDERSTANDING YOUR SENSES; EASY EXPERIMENTS FOR YOUNG PEOPLE
612 Gle	Glemser, Bernard. ALL ABOUT THE HUMAN BODY
612 Gro	Groch, Judith. YOU AND YOUR BRAIN
612 Gru	Gruenberg, Benjamin C. THE WONDERFUL STORY OF YOU; YOUR BODY - YOUR MIND - YOUR FEELINGS
612 Hum	THE HUMAN BODY
612 Hyd	Hyde, Margaret O. YOUR BRAIN-MASTER COMPUTER
612 Kas	Kastner, Jonathon. SLEEP; THE MYSTERIOUS THIRD OF YOUR LIFE
612 Lau	Lauber, Patricia. YOUR BODY AND HOW IT WORKS

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612 Leo	Leokum, Arkady, THE HUMAN BODY; HOW IT WORKS
612 Lib	Liberty, Gene. THE FIRST BOOK OF THE HUMAN SENSES
612 McC	McCulloch, Gordon. MAN AND HIS BODY; THE STORY OF PHYSIOLOGY
612 Mil	Miller, Benjamin F. MAN AND HIS BODY; THE WONDERS OF THE HUMAN MECHANISM
612 Nou	Nourse, Alan E. THE BODY
612 Pag	Page, Jake. BLOOD, THE RIVER OF LIFE
612 Rie	Riedman, Sarah R. THE WORLD THROUGH YOUR SENSES
612 Sch	Schuman, Benjamin N. THE HUMAN EYE
612 Sho	Showers, Paul. USE YOUR BRAIN
612 Sil	Silverstein, Alvin. THE STORY OF YOUR EAR
612 Smi	Smithline, Frederick. ANSWERS ABOUT THE HUMAN BODY
612 Spr	Sproul, Edith E. THE SCIENCE BOOK OF THE HUMAN BODY
612 Wea	Weart, Edith Lucie. THE STORY OF YOUR BLOOD
612 Wea	Weart. Edith Lucie. THE STORY OF YOUR BRAIN AND NERVES
612 Wea	Weart, Edith Lucie. THE STORY OF YOUR GLANDS
612 Wea	Weart. Edith Lucie. THE STORY OF YOUR RESPIRATORY SYSTEM
612 Wer	Wertenbaker, Lael. THE EYE, WINDOW TO THE WORLD
612 Wil	Wilson, Mitchell. THE HUMAN BODY; WHAT IT IS AND HOW IT WORKS
612 Zim	Zim, Herbert Spencer. YOUR HEART AND HOW IT WORKS
612.09 Rie	Riedman, Sarah R. HOW MAN DISCOVERED HIS BODY
612.1 Sch	Schneider, Leo. LIFELINE; THE STORY OF YOUR CIRCULATORY SYSTEM
612.6 Bec	Beck, Lester F. HUMAN GROWTH; THE STORY OF HOW LIFE BEGINS AND GOES ON
612.6 Gru	Gruenberg, Sidonie Matsner. THE WONDERFUL STORY OF HOW YOU WERE BORN
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612.6 Pow	Power, Jules. HOW LIFE BEGINS
612.6 Tan	Tanner, James M. GROWTH
612.64 Day	Day, Beth. SECRET WORLD OF THE BABY
612.64	Ets, Marie Hall. STORY OF A BABY
612.8	Sutton-Van, Sybil. STORY OF EYES
612.8	Zim, Herbert Spencer. OUR SENSES AND HOW THEY WORK
613 Gra	Gramet, Charles. YOUR HEALTH AND YOU
613 Mer	Meredith, Florence L. HEALTH AND FITNESS Diseases: pp. 235-96
614 Dub	Dubos, Rene. HEALTH AND DISEASE
616 Lap	Lapage, Geoffrey. MAN AGAINST DISEASE
616 Mar	Martin, Lealon E. CONQUEST OF DISEASE: THE CHALLENGE OF YOUR LIFE
617 Sku	Skurzynski, Gloria. BIONIC PARTS FOR PEOPLE; THE REAL STORY OF ARTICIFICIAL ORGANS AND REPLACEMENT PARTS
636 Chr	Chrystie, Frances N. PETS; A COMPLETE HANDBOOK ON THE CARE, UNDERSTANDING, AND APPRECIATION OF ALL KINDS OF ANIMAL PETS
636 Dob	Dobrin, Arnold. GERBILS
636 Gut	Guthrie, Esther L. HOME BOOK OF ANIMAL CARE
636 Hah	Hahn, James. HAMSTERS, GERBILS, GUINEA PIGS, PET MICE, AND PET RATS
636 Hes	Hess, Lilo. PROBLEM PETS
636 Hog	Hogner, Dorothy Childs. ODD PETS
636 Mor	Morgan, Alfred. A PET BOOK FOR BOYS AND GIRLS
636 Shu	Shuttlesworth, Dorothy E. CARING FOR GERBILS AND OTHER SMALL PETS
636 Shu	Shuttlesworth, Dorothy E. GERBILS AND OTHER SMALL PETS
636.08 Mat	Mathews, RIchard K. WILD ANIMALS AS PETS
636.7 Fox	Fox, Michael W. UNDERSTANDING YOUR DOG

636.7 Jam	James, Douglas. THE WONDERFUL WORLD OF DOGS
636.7 Lam	Lampson, S.M. COUNTRY LIFE BOOK OF DOGS
636.7 Mee	Meek, Sterner St. Paul. SO YOU'RE GOING TO GET A PUPPY
636.7 Pug	Pugnetti, Gino. THE GREAT BOOK OF DOGS; AN INTERNATIONAL ANTHOLOGY
636.7 Rid	Riddle, Maxwell. YOUR FAMILY DOG; THE COMPLETE GUIDE TO CHOOSING, CARING FOR, TRAINING, AND SHOWING
636.7 Sta	STANDARD GUIDE TO PURE-BRED DOGS
636.7 Whi	White, Kay. PRACTICAL GUIDE TO DOGS
636.8 Bes	Besser, Marianne. THE CAT BOOK
636.8 Bro	Bronson, Wildred S. CATS
636.8 Car	Carr, William H.A. THE BASIC BOOK OF THE CAT
636.8 Mil	Miller, Harry. COMMON SENSE BOOK OF KITTEN AND CAT CARE
636.8 Unk	Unkelbach, Kurt. CATNIP, SELECTING AND TRAINING YOUR CAT
638 Vil	Villiard, Paul. INSECTS AS PETS
639 Buc	Buck, Margaret Waring. SMALL PETS FROM WOODS AND FIELDS
639 Ric	Ricciuti, Edward R. SHELF PETS; HOW TO TAKE CARE OF SMALL WILD ANIMALS
746.6 Dey	Deyrup, Astrith. TIE AND BATIK DYEING.
746.6 Fra	Frame, Mary. TIED-DYEING AND BATIK
746.6 Nea	Nea, Sara. TIE-DYE; DESIGNS, MATERIALS, TECHNIQUE
750 Bla	Blanch, Arnold. IT'S FUN TO PAINT; PAINTING FOR ENJOYMENT (Pigments)
751 Haw	Hawkinson, John. COLLECT, PRINT, AND PAINT FROM NATURE (Pigments)
751 May	Mayer, Ralph. ARTIST'S HANDBOOK OF MATERIALS AND TECHNIQUES
751.4 Wei	Weiss, Harvey. PAINT, BRUSH AND PALETTE (Pigments)
751.4 Zai	Zaidenberg, Arthur. HOW TO PAINT IN OIL; A BEGINNER'S BOOK FOR BOYS AND GIRLS (Pigments)
811 O'Ne	O'Neill, Mary. HAILSTONES; ADVENTURES IN COLOR (Pigments)

DISEASES

Information on various diseases may be found in the pamphlet files.

ORGAN TRANSPLANTS

Check the following magazine indexes:

CHILDREN'S MAGAZINE GUIDE under
Transplants of Organs, Tissue, etc.

UNABRIDGED READERS' GUIDE under
Transplantation of Organs, Tissues, etc.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Plant Growth and Responses **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 2 Plant Growth and Responses	Write a composition comparing changes that occur in trees from season to season to the changes in kinds of clothing people wear from season to season.	Collect variety of seed. Try to identify what adaptation each kind of seed has for being dispersed.	Select 5 different types of flowering plants that grow in neighborhood. Find out if these plants require specific periods of daylight/darkness for their flowers to develop. Chart your results and report to class.	
	Obtain 3 cross sections of different kinds of tree trunks. Determine the age of each tree by counting the annual rings which will indicate the amount of growth that takes place.	Write a story in which a cactus is transported to a place where the climate is cool and rainy. Describe how the cactus complains about conditions for which it is not adapted.	Bulletin Board	
	Look up and tell us what DENDROCHRONOLGY means -			
	Look at plants at home - Find examples of Phototropism. Report findings to class.			

GRADE SIX CLUSTER BIBLIOGRAPHY
PLANT GROWTH AND RESPONSES

Ref 423 Web	WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY OF THE ENGLISH LANGUAGE. Look up dendrochronology. Look up phototropism. You will find this unabridged dictionary on the dictionary stand.
Ref 500 New	THE NEW BOOK OF POPULAR SCIENCE. Cactus: Consult the index at the end of Volume 6.
Ref 500.103 Dis	DISCOVERING NATURAL SCIENCE. Look up phototropism in the index.
Ref 503 Com	COMPTON'S ILLUSTRATED SCIENCE DICTIONARY. Look up phototropism.
Ref 503 Har	HARPER ENCYCLOPEDIA OF SCIENCE. Look up dendrochronology. Look up phototropism. (Be sure to follow the cross-references.)
Ref 503 Van	VAN NOSTRAND'S SCIENTIFIC ENCYCLOPEDIA. Look up phototropism (You will be given two cross-references)
Ref 574.03 Aud	AUDUBON NATURE ENCYCLOPEDIA. Cactus: pp. 352-357.
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Ref 582.13 Hyl	Hylander, Clarence J. THE MACMILLAN WILD FLOWER BOOK
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574 Par	Parker, Berrtha Morris. PLANTS, ANIMALS, AND US
580 Hyl	Hylander, Clarence. THE WORLD OF PLANT LIFE
580 Jaq	Jaques, H.E. PLANT FAMILIES; HOW TO KNOW THEM
580 Sel	Selsam, Millicent. PLAY WITH PLANTS
580 Zim	Zim, Herbert Spencer. PLANTS; A GUIDE TO PLANT HOBBIES
581 Dic	Dickinson, Alice. THE FIRST BOOK OF PLANTS
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581 Gui	Guilcher, J.M. A FRUIT IS BORN
581 Hut	Hutchins, Ross E. STRANGE PLANTS AND THEIR WAYS

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581 Sel	Selsam, Millicent E. PLANTS THAT MOVE
581 Sel	Selsam, Millicent E. PLANTS WE EAT
581 Sel	Selsam, Millicent E. PLAY WITH SEEDS
581 Ste	Stefferud, Alfred. WONDERS OF SEEDS
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581 Van	Van Overbeek, Johannes. THE LORE OF LIVING PLANTS
581 Wen	Went, Frits W. THE PLANTS
581-072 Kli	Klien, Richard M. DISCOVERING PLANTS; A NATURE AND SCIENCE BOOK OF EXPERIMENTS
581.1 Bak	Baker, Jeffrey J.W. VITAL PROCESS; PHOTOSYNTHESIS
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582 Cav	Cavanna, Betty. THE FIRST BOOK OF WILD FLOWERS
582 Cut	Cuthbert, Mabel J. HOW TO KNOW THE SPRING FLOWERS
582.13 Dow	Dowden, Anne Ophelia T. LOOK AT A FLOWER
582 Ham	Hammond, Winifred G. THE RIDDLE OF SEEDS
582 Jau	Hausman, Ethel Hinckley. BEGINNER'S GUIDE TO WILD FLOWERS
582 Hut	Hutchins, Ross E. THE AMAZING SEEDS
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582.13 Hun	Huntington, Harriet E. LET'S LOOK AT FLOWERS
582.13 Hut	Hutchins, Ross Ed. THIS IS A FLOWER
582.13 Mar	Marotta, Juanita. MINNESOTA WILD FLOWERS OF FOREST, FIELD AND WETLAND
582.13 Mon	Monserud, Wilma. COMMON WILD FLOWERS OF MINNESOTA
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582.13 Pet	Peterson, Roger Tory. FIELD GUIDE TO WILDFLOWERS OF NORTHEASTERN AND NORTH-CENTRAL NORTH AMERICA
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ENRICHMENT ACTIVITY MATRIX

TOPIC: Trees **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	**PROCESS I** APPLICATION	**PROCESS II** ANALYSIS	**PROCESS III** SYNTHESIS	**PROCESS IV** EVALUATION
Study of common trees and be able to identify by common name.	Visual display showing pencil sketch, examples of leaves, twigs, bark, flowers, seeds, and habitat.	Choose 5 trees' common names. Research scientific names in and around your home. Samples of leaf, twig, bark, flower, seeds, etc.	Oral presentation to class. Collection of mounted samples with common and scientific name.	
Arboretum	Arrange with naturalist a field trip. Interview naturalist. Record information. Arrange for naturalist to speak to class.	Choose 5 trees' -- different from around your area. Common and scientific names. Samples of leaf, twig, bark, flower, seeds, etc.	Video-tape of trip to arboretum -- including trees, naturalist, and extra inforamtion gained. Introduce naturalist to class.	
Forest Ranger	Arrange interview. Record information. Arrange for range to speak to class.	Information Forest fires; what are the qualifications needed to be a ranger; what all is included in his job?	Share inforamtion from ranger. Introduce forest ranger to class.	

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ENRICHMENT ACTIVITY MATRIX

TOPIC: Animal Adaptations **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 3 Adaptations (Animal)	In literature bats are shown in a negative way - Research stories in which bats are referred to. Give reasons why they are depicted negatively. Report to class	Investigate the role of the structural adaptation of the Kangaroo - the pouch. Report to class.	Scaly skin of reptiles makes them better adapted to life on life on land. Another adaptation freed reptiles of returning to water to breed. Find out: How did this adaptation allow reptiles to colonize land area off limits to amphibians? Report findings to class.	
Bat Conservation International Goal: Depict Bats in a Positive Way!	Write a story highlighting the best features of bats. Present to class.	Write a composition "WHAT IF" example what if kangaroos were as large as the largest dinosaurs?	Bulletin Board	
Migration Times and Routes research migration - Draw maps and migration routes of birds and mammals of your choice.	Many important plants depend on bats for their pollination. Research plants dependent on bats and prepare maps indicating where these plants typically grow. Report to class.	Bills, or beaks, of different birds are adapted to many different kinds of food. Collect pictures and information of birds in which bills are easy to see. What kind of food does each eat? What is their main diet?	Minnows change color to match their surroundings. Fill 2 jars with water, place minnows in each jar - put light colored paper under jar 1, dark paper under jar 2. What did you observe after 30 minutes?	
	Write a story in which a frog or salamander describes the process of going into hibernation as winter approaches.	Estivation is a state of torpor in which some animals spend periods of hot, dry conditions. Investigate this adaptation. Identify animals that estivate.	Bulletin Board	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Climate and Life **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 4	Taiga: Write description, draw pictures, or make dioramas of taiga. Share with class.	Select one animal that is found in a deciduous forest. Find out: How it feeds Where it feeds - What does it do in the winter? Report to class.	In 1985, special research vessels investigated deepest part of Lake Superior. What unusual forms of life did they find?	
	Construct a mural or series of dioramas showing deciduous forest scene in all four seasons.	Investigate how bison (buffalo) almost became extinct in this country from overhunting. Share info with class.	Make a bulletin board of fresh water food chain - Include: plants, insects, frogs, fish and water snakes.	
	A scientists once estimated that before people arrived in North America: A squirrel might have been able to travel from Atlantic Ocean shore to the Pacific Ocean shore without touching the ground. HOW - EXPLAIN.	Write a composition evaluating one or more: 1. Should countries have the right to fish in the open sea without limit? 2. Do countries without coastlines have fishing rights?	Study different maps of North America and find life zones or biomes. Why are they located where they are?	

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ENRICHMENT ACTIVITY MATRIX

TOPIC: Weather **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Study of weather Speed of toboggan	Experiment: Speed of toboggans State the hypothesis (guess) Set up investigation. Record data. Draw conclusion from results.	Listen to directions. Collect data. Follow project outline. Individual thinking. Follow safety procedures.	Present to class how you set up your experiment.	
Relationship between mass/how fast? S = D ÷ T	Each student will weight in with coat and boots on. Record your weight. Arrange for a toboggan or snow innertube - Stop watch & Tape measure Clip board and paper Flag	Establish starting line and finish line. Measure the distance between them. Time the toboggan; record data. Time the 1st person on toboggan. Time 3rd person on toboggan. Record each result on sheet.	Worksheet on speed of toboggan. Calculate the average speeds using S = D ÷ T. Show all of your calculations for the different combinations. Explain S = D ÷ T to class and present your results.	
Constant Factors Slope of hill Condition of hill Length of run Length of toboggan Variable Factor Weight of each student	Conduct investigation. List factors that worked against conditions - Did toboggan tip over? Did toboggan go off the path? Too much snow? Not enough snow?	Experiment on combinations and things that could happen -- tip over, off path, etc.	Results of experiment. Share results with class. Results won't always be perfect. Show charted data from worksheet.	
Almanac Predictions	Fact or fiction? List some of predictions.	Record several predictions. Look up weather we have had the last three months. Did they correctly predict? Wives tales about weather. Try to write your predictions for the next month.	Share some of the myths, tales, predictions with class. How accurate were you? Share results.	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Weather **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 12 Weather	Invite a meteorologist to give a talk to class.	What is the National Weather Service? What does it do? How much do Minnesota meteorologists depend on it?	Put on a weather forecast, using weather maps. Make your forecast believable, based on real knowledge about the weather.	Visit a weather station and see how their weather instruments and data are used.
Chapter 12 Weather	Report on one of these topics: Use of updraft, or thermals, in soaring, use of lightning rods, work of Benjamin Franklin in proving that lightning is electricity.	Research about "hurricane hunters" before we had the use of satellites and radar.	Invite an employee of National Weather Service to discuss what this agency does with the class. Bulletin Board.	

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PAMPHLET -- OLD FARMER'S ALMANAC

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See WORLD BOOK ENCYCLOPEDIA for article Glider.

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See Article Lightning Rod in WORLD BOOK ENCYCLOPEDIA.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Energy **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
1. Heat Loss	Demonstrate the inefficiency of converting electrical energy to light energy.	Experiment heat loss 1. How much has the temperature changed.	Explain fully where heat came from. Demo	Demonstration in class HEAT LOSS
2. Energy Conversion	Demonstrate conversions of potential energy to kinetic energy and Kinetic energy to another form of Kinetic energy.	Experiment energy conversion 1. When the heated water turns to vapor and steam. What happens and why?	Explain conversion terms of kinetic and potential energy.	Demonstration in class ENERGY CONVERSION
3. Steam Turbine	To demonstrate how steam turns a turbine.	Experiment steam turbine 1. What happens when water boils? 2. How steam-turbine is used to generate electricity? 3. How fossil fuels are used to drive a steam turbine?	Explain how a steam turbine works.	Demonstration in class HOW A STEAM TURBINE WORKS
4. Energy Conversion Efficiency	To determine whether incandescent or florescent lighting is more efficient.	Which gives off more light? Which gives off more of its energy as unused heat? Which bulb produces light more efficiently?	Explain which is more efficient and why?	Demonstrate ENERGY CONVERSION EFFICIENCY
5. Solar Heat	To show how the sun can naturally heat a building.		Explain how sun can heat a building?	Demonstrate SOLAR HEAT

ENRICHMENT ACTIVITY MATRIX

TOPIC: Energy (Continued) **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
6. Insulation	Demonstrate how insulation in the walls of a building saves energy.	Experiment Insulation - Did temperature drop with or without cotton - why?	Explain fully how insulation in walls saves energy.	Demonstration of experiment on insulation to class.
7. Weatherstripping	To demonstrate the effectiveness of weatherstripping.	Experiment - 1. In which case did the temperature drop more - Why? Where in you home might this same leakage occur?	Explain weatherstripping -- airtight or why leakage occurs.	Demonstration on weatherstripping.
8. Solar Collector	To determine which color is best for solar collectors.	Experiment - Solar collector 1. Which bag is hottest, coolest? Causes for differences in temperature, which color should be a solar collector? Which color roof would keep house coolest?	Experiment solar collector.	Demonstration of solar collector.
9. Solar Hot Dog Cooker	To demonstrate how you can cook a hot dog with solar energy.	How long does it take to cook a hot dog? Why don't we use the sun more often to cook?	Experiment using solar hot dog cooker.	Demonstration of solar hot dog cooker
10. Chain Reaction	To demonstrate the chain reaction in a nuclear fission power plant.	Experiment chain reaction using dominos Were all the dominos tipped over in both patterns? Which pattern demonstrates how a nuclear reactor works?	Explain chain reaction.	Demonstrate chain reaction showing both patterns.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Energy (Continued) **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
11. Splitting an Atom	To simulate the splitting of an atom.	Experiment atom 1. When the drop stayed inthe middle of glass, why was it perfectly spherical? 2. What happened when you first tried to prod the drop apart? 3. What did you finally end up with?	Explain experiment results.	Experiment splitting an atom
12. Making Hydrogen	To demonstrate how electrolysis is used to separate hydrogen from water.	Experiment	Explain what happens and why.	Demonstrate experiment.

RESOURCE

THE ENERGY SOURCE EDUCATION COUNCIL, Energy Crunch (booklet) plus associated materials. Contact NSP.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Investigating Our Physical World **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Matter and Atoms	Write a description of how the world would appear to them if they were small enough to sit on an eggshell "cliff".		Bulletin Board	
	Research: Report on isotopes - include uses for isotopes in medicine and industry and the methods by which they are identified.			
	Look up the names and uses of other salts - such as: Potassium chloride - Mercuric chloride			

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ENRICHMENT ACTIVITY MATRIX

TOPIC: Chemical Changes in Matter **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 6 Chemical Changes in Matter	What effect does a magnet have on iron filings and rust?	Find out about the first controlled, self-sustained nuclear fission reaction.	Bulletin Board	
	Research perpetual motion machines including the role of conservation of energy in making these machines impossible.	Determine the masses found on each side of the fusion reaction.		
	Research what transoceanic travel was like in hydrogen-filled dirigibles.			

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ENRICHMENT ACTIVITY MATRIX

TOPIC: Light Energy **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 7 Light Energy	Investigate the Greek myth about Narcissus - Report to class.	Write a composition describing how a light wave might feel as it bounces off some objects, passes through others, and finally absorbed by matter.	Research use of lasers.	
	Calculate the amount of time it takes for sunlight to travel from sun to the earth.	Write a poem about sunlight being transformed into a rainbow after a storm.	Bulletin Board	
	Investigate the potential harmful effects to the living things that would result from damage to the earth's ozone layer - Report to class.		Write a humorous poem based on the fact that because of refraction, an object may not actually be where it seems to be.	

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Use the magazine indexes to locate information on OZONE LAYER

ENRICHMENT ACTIVITY MATRIX

TOPIC: Sound Energy **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 9 Sound Energy dissonance enunciate modulation resonate stridulate syrinx	Construct a cross word puzzle using these words - Be sure you write short definitions as clues: aeolian tones anechoic cacophony	Write a composition using these words: compressed word rarefied air compress compressed air	Bulletin Board on sound energy.	
	Research on impact of the 17th century Italian violin makers on culture of their era.	Illustrate a change in the form of energy. Mechanical energy, relate this to Law of Conservation of Energy.	Resource speakers. Make contact and arrangements.	
	Read about the application of the Doppler effect in astronomy. Change in speed of light with distant bodies is called Red Shift. Research to find out what this means.	Look up origin of term: mach number - Devise a demonstration to show what it is.		

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See articles under "violin" in a general encyclopedia

ENRICHMENT ACTIVITY MATRIX

TOPIC: Using Electricity **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 9 Electricity	Report on use in banks of photoelectric cells to produce electrical energy in space craft.	Find out what outside source of energy is used in the production of electrical energy that we have in our area.	Invite speaker to talk with class on large generators that produce electricity.	
	Create a way to demonstrate voltage. Be creative, use your imagination and design a method of demonstration.	Contact local hospitals to learn about back up generators used to supply energy in emergency situations.	Set up some simple circuits. Use variety of wires, dry cells, and light bulbs. You may add bells and/or switches to demonstrate.	
	Research how integrated circuits are made.	Research early computers (ENIAC) compare the technology, size and speed of early computers with features of present day models. Present findings to class.	Contact car dealerships for information about the use of computers in cars. Bulletin Board	

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ENRICHMENT ACTIVITY MATRIX

TOPIC: Investigating Earth & Space **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	**PROCESS I** APPLICATION	**PROCESS II** ANALYSIS	**PROCESS III** SYNTHESIS	**PROCESS IV** EVALUATION
Chapter 10 Earth's Resources	Construct a crossword puzzle using these words - Write definitions as clues. How do the words relate to earth's resources? profuse lavish capious bounteous munificent incalculable ample innumerable vast unfathomable	Visit a local water department: Describe the source and treatment of your local water.	Invite an official to talk to class on water treatment.	
Using cookbook - present a menu consisting only of products from the ocean.	Write a story about a space voyage in which green plants play a role in replenishing oxygen supply.	Research mines. Find sizes and depths of the country's largest mine.	"Found Objects" is a kind of recycling - Make a sculpture or other works of art using only junk for materials.	
Agar: Comes from red algae What is it used for today?	Research construction of offshore drilling platforms. Demonstrate what you have learned.	Find out about the Trans-Alaskan Pipeline. Report on problems that occurred during its construction and about the importance of the pipeline.	Research on methods of harvesting sea-floor modules. Report to class. Bulletin Board	

GRADE SIX CLUSTER BIBLIOGRAPHY
THE EARTH'S RESOURCES

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Ref 423 Web	WEBSTER'S INTERMEDIATE DICTIONARY; A NEW SCHOOL DICTIONARY (for crossword puzzle definitions)
Ref 423 Web	WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY OF THE ENGLISH LANGUAGE (for crossword puzzle definitions)
Ref 423 Wor	WORLD BOOK DICTIONARY (for crossword puzzle definitions)
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Check the index for names of dishes using various fish or shellfish

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CHILDREN'S MAGAZINE GUIDE Look Under
Oil Well Drilling - Alaska

NATIONAL GEOGRAPHIC INDEX Check under
Alaska Pipeline

READER'S GUIDE TO PERIODICAL LITERATURE
Look under Petroleum Pipelines - Alaska

MINES Look in the NATIONAL GEOGRAPHIC INDEX under Mines and Mining. ALso notice the "See Also" cross references at the end of the listing

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ALASKA (For information about the Trans-Alaskan Pipeline)

DRINKING WATER
- Water - Minnesota
- Water Conservation - Minnesota
- Water - Floridation
- Water Pollution - Control - Minnesota
- Water Pollution - Hennepin County
- Water Pollution - Measurement - Twin Cities Metropolitan Area
- Water Pollution - Minnesota
- Water Purification
- Water Resources Development - Minnesota
- Water Supply
- Water Supply - Floridation
- Watersheds - Minnesota

PAMPHLET FILES

MINES Iron Mines and Mining - Minnesota

ENRICHMENT ACTIVITY MATRIX

TOPIC: Changes in Earth's Crust **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 11 Changes in Earth's Crust	Research present-day kinds of alligators and where they are found. Use the theory of continental drift to help explain the geographical separation of related species.	Why was Project Mohole aborted?	Read and report to class on: the recent creation by volcanic eruption, of the Island of Surtsey off the coast of Iceland.	
	Imagine you are a scientist in the early part of this century - Write a letter to Alfred Wegener explaining why you are supporting or not supporting his theory.	Research the ways nations and communities are preparing to deal with future earthquakes: drills, evacuation plans, and building codes related to earthquake -proofing.	Read and report to class on: the recent creation by volcanic eruption, of the Island of Surtsey off the coast of Iceland.	
	Research ways in which Icelanders use geothermal energy to provide hot water and heat.	Read about one account of an expedition to the top of Mount Everest. Tell the class of the dangers and hardships of expeditions.	Bulletin Board	

GRADE SIX CLUSTER BIBLIOGRAPHY
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Tibet: Volume 2

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- - - -

ICELAND - Check the National Geographic index for articles.

ICELAND - Consult pamphlet files

SURTSEY - Check the National Geographic index

TIBET (Living at high altitudes) Consult an article about Tibet in any general encyclopedia

EARTHQUAKES: Consult these magazine guides under Earthquakes:
Children's Magazine Guide
National Geographic Index
Reader's Guide to Periodical Literature
(The Reader's Guide will also give information under Earthquake Prediction and Earthquakes and Building.)

GEOTHERMAL RESOURCES: Check the pamphlet files.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Oceanography **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Whales Giant Mammals	Video Display on bulletin board on whales Mobile Puzzle	Research: Collect and record information to answer questions on list.	Share information with class. Show video.	
Choose topic: (a) any animal that lives in the ocean (b) narrow down to specific species of animal	Locate at least 5 sources of information and make a bibliograpy card for each one. Mobile Pictures Slides Locate what you can on: life span, social behavior, migration, unusual habits, territory needs, population, and where the animal lives in the ocean.	Record information on cards. Make a bibliography card. Use many sources. Describe animal's adaptation -- how does this animal fit food web, what does it eat. Habitat. Information about reproduction, mating habits, care of young.	Mobile Slides Picture collection Poster display Charts, graphs Diorama (showing animal in natural habitat) Puppet show demonstration	
Sources of Information	Books, TV, video tapes, film strip, periodicals, pamphlets--Marine Research Center, aquarium, zoologist, Science World, Current Science, posters. Arrange for a zoologist to give presentation to class.	Make yourself comfortable with all types of resource materials -- using library skills already taught.	Introduce zoologist to class and tell area or topic they will speak on.	

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CHILDREN'S MAGAZINE INDEX
NATIONAL GEOGRAPHIC INDEX

ENRICHMENT ACTIVITY MATRIX

TOPIC: Oceanography
Voyage of the Mimi - Episode

TEACHER: Jan Jacobson

SCHOOL: Orono Middle School

GRADE: 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS
1. All Aboard	Observation - Good listening skills		
2. Setting Sail	Answer questions about each individual episode after finishing research part of unit.		
3. On the Shoals			
4. Counting Whales			
5. Going Fishing			
6. Home Movies			
7. Fastening On			
8. Tracking the Whale			
9. Shipwrecked			
10. Making Dew			
11. The Feast			
12. Rolling Home			
13. Separate Ways			

ENRICHMENT ACTIVITY MATRIX

TOPIC: Oceanography (cont.) **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6
Voyage of the Mimi - Expedition

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS
1. Planet Ocean New England Aquarium	Observation - Good listening skills Answer questions about each individual expedition after finishing research part of unit.		
2. Whalewatch Provincetown Center for Coastal Studies			
3. Mapping the Blue Part Lamont-Doherty Geological Observatory			
4. Whale Bones Smithsonian Museum of National History			
5. Scraping the Bottom Woods Hole marine Biological Lab			
6. Songs In the Sea Studies of Whale Researcher Katy Payne			
7. Hands Full of Words Gallaudet College			

ENRICHMENT ACTIVITY MATRIX

TOPIC: Oceanography (cont.) **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6
Voyage of the Mimi - Expedition

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS
8. The World's Worst Weather Mt. Washington Observatory	Observation - Good listening skills Answer questions about each individual expedition after finishing research part of unit.		
9. Goose Bumps U.S. Army Research Institute of Environmental Medicine			
10. Water, Water, Everywhere Mona, INC. Greenport R.I.			
11. A New Alchemy New Alchemy Institute			
12. Boatship Landing Boatshop			
13. A Sailor & A Scientist Plasma Fusion Center M.I.T.			

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OCEANOGRAPHY: VOYAGE OF THE MIMI

Resources:

Videotape	THE VOYAGE OF THE MIMI
Book	THE VOYAGE OF THE MIMI

ENRICHMENT ACTIVITY MATRIX

TOPIC: Astronomy **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Study of the Universe Choice of topics	Visual display Bulletin board Video A	Research (note taking) Outline material (using the research skills we have had). Note cards Bibliography Make up a worksheet with questions you have answered in research. See list of topics. B	Oral presentation. Written report to hand in. Cassette tape Video tape C	
Constellations	Star charts Locate as many of the signs of the Zodiac as you can find during this period of time. D	Draw constellations located. Construct your own chart for zodiac. Come up with your own way to identify constellations. E	Present your new chart to class and show them how it works. Collect Greek and Chinese myths connected to the constellations. 3-D model of one constellation. Tape the myth written in your own words. F	
Telescope Observatory Planetarium	Arrange a field trip to Planetarium. Compare your telescope to theirs. G	List questions you haven't found answers to in your research. Ask questions at Planetarium. H	What was the first telescope like? Construct a telescope from things at home that would resemble the first telescope. I	
		Research astronomers J	Report on what they are noted for. K	

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Ref 503 Lex	LEXICON ENCYCLOPEDIA OF SCIENCE
Ref 503 You	YOUNG PEOPLE'S SCIENCE ENCYCLOPEDIA
Ref 520 Enc	THE ENCYCLOPEDIA OF SPACE TRAVEL AND ASTRONOMY
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ENRICHMENT ACTIVITY MATRIX

TOPIC: Space **TEACHER:** Jan Jacobson **SCHOOL:** Orono Middle School **GRADE:** 6

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 13 Space - Use these words to write a scientific report; venerable Primordial immemorial primeval antiquated archaic superannuated antediluvian	You are from a distant planet and have landed on Earth. The time is 3,000 years from now. During an archaeological dig, you discover a small round object dated 1984. Using the words on the list, write a scientific report about the 1984 civilization, based on the object.	If you have a telescope, describe some of your observations and display sketches of objects you have observed.	Report to class on the impact that Russia's success with Sputnik had on America's priorities in education and technology.	
	Visit a planetarium or observatory. Report to class on visit.	Research early years of space program, include different satellites and discoveries made with them.	You are the first astronaut on the lunar surface. Write a description of what you are experiencing on the moon.	
	Write a story that is science fiction about life in a space colony.	Show video on space and you be the narrator.	Bulletin Board.	

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Check the box on page 346 to determine which section sof the article will be most useful.

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Check the box on page 272 to determine which sections of the article will be most useful.

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Check for articles in the National Geographic Index listed under Space Flight and Research. Also check the cross-references. ("See also") at the end of the listing.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Population

TEACHER: George Johnson
SCHOOL: Orono Middle School

GRADE: 7

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Bird Houses	Describe the necessity of numbers and kinds of bird houses (variety) in an area.	Set up a coordinated area of study for a specific period of time. Construct fall and winter, observe in the spring.	Construct bird houses shop home in class	
Bird Feeders	Describe the need for having several kinds of bird feeders/area.	Set up a coordinated area of study for specified period of time. Construct and maintain in the fall. Supply and observe all winter.	Construct bird houses shop home in class (For inf. Audubon Chapter of Mpls.)	
Bird Observation	After construction, set up houses and feeders in community, at home or at school. Careful to note kinds, their location, and why they are located there.	Observe and keep a diary of the bird feeders and bird houses for a designated period of time.		

ENRICHMENT ACTIVITY MATRIX

TOPIC: Ecology

TEACHER: George Johnson
SCHOOL: Orono Middle School

GRADE: 7

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Animal (1021-1039)	Can life exist without the sun? If so, what kind and where?	Describe the fuel you would develope that would be non-polluting to everything.	Examine the pros and cons of solar radiation and photosynthesis. (We must have sun for photosynthesis, but can we get too much radiation?)	Diagram the following cycles: nutrient, carbon, and nirtogen. Write a short report about each.
Communities (1023)	By using magazines, newspapers (pictures), set up a Biome and explain it.	In your mind's eye, what would it be like to be controlled by an insect population (insects taking over the world)? Use any mans to describe. You would like to describe your reactions -- play, story, pictures, etc.		Develop and set up your own micro-habitat. This could be from several communities.
Theoretical (A-20)	There is a theory that our earth is warming up. Describe the ecological effects.	First, research the effects of lightning and the amount of nitrogen it gives the earth. Second, develop a method of synthetic lightning to add additional nitrogen.	Review the book: Theoretical Ecology, Robert H. MacArthur and E.O. Wilson. Write a short report on why some animals are becoming extinct.	Prepare a chart that would explain the production, use and effects of nitrogen as a fertilizer.
References: 1. Zoology, Ch. 41, pp. 1021-1041 2. L.S. text, p. 509 3. L.S. white old text, pp. 433-455 4. L.S. brown old text, Ch. 2, pp. 17-104				

ENRICHMENT ACTIVITY MATRIX

TOPIC: Structure of Life

TEACHER: George Johnson
SCHOOL: Orono Middle School

GRADE: 7

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Matter	Experiment: Premise: In ordinary chemical change, matter is neither created nor destroyed. Use 5 farmer's matches, bind with string, place in test tube cap with balloon airtight. Weigh, put over heat and burn; weigh again. (pp. 60-61, LIF & C Green)	Create several molecular models of matter and be ready to present. (pp. 61-62 LIF & C)	You are a scientist and are working on some new matter; what would it be and what would it do?	Evaluate the use and misuse of matter by the production of a video.
Osmosis	Experiment: Tie cellophane over wide end of funnel; fill funnel with sugar solution. Place in beaker of pure water so that levels of solution are equal. Observe and record. Explain results. (pp. 85-86 Zoo; also p. 36 of L.S. White)	Draw diagram showing how the processes of osmosis work in plants. Explain.	Prepare a list of examples of diffusion and osmosis in everyday life. (p. 63, Green #1)	Explain: If a cell membrane were not semipermeable the cell might die. Why must materials move in and out of cells?
Homeostasis	Homeostasis is maintined by the coordinated activities of numerous body systems. Explain this concept. (Zoo, p. 723)	Create a model to relate the concept of homeostasis (like a see-saw)	Describe the outcomes and effects on our local environment - if the polar caps would melt. How would this affect the homeostasis?	Explain: How do feedback mechanisms maintain homeostasis? Give three examples.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Viruses and Monerans

TEACHER: Geo. Johnson
SCHOOL: Orono Middle School

GRADE: 7

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
I. Library II. Use immigration of materials III. Hospitals, operating rooms, plastic domes.	1. Compare and contrast virusus, monerans, bacteria on the following variables: (You add size, appearance, "food" source, reproduction process, habitat) 2. Choose 1 example of each species, and (a) draw a picture, (b) give details of size, food source, etc. (c) name specific benefits or damage caused by this species.	Make a model of a virus & a moneran, or a bacteria (may do more than one) Use materials found around home. Try to make the model larger than your hand.	Do a future wheel on what if there were no germs. Research to discover positive and negative implications. no first-aid creams needed ecological unbalance no infections GERM-FREE	
I. Visit electron microscope (North Henn. Tech.) II. Cambridge Development Lab. Inc. Page 17 Cat #MED-0-04A	1. Draw comparative diagram of microscope and electron microscope. 2. Where can the regular microscope be most useful? 3. Where can the electron microscope be most useful.	Set up a graph on the reproduction rates of viruses and monerans.	1. Research to find 3 treatments people (or doctors) have tried to cure the common cold. 2. Evaluate the effectiveness of these treatments. 3. Develop a new cure 4. Design an experiment to test your new cure 5. Did it work? How do you know?	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Classification

TEACHER: Geo. Johnson
SCHOOL: Orono Middle School

GRADE: 7

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
I. Ref. Investigation #73 II. Ref. Zoology page 146 III. Ref. Zoology page 151	1. Choose a local common insect. 2. Collect 12 specimens of the insect. 3. Make a chart of the similarities and differences in the 12 specimens. 4. Research Latin name and meaning of insect's name. 5. Write a paragraph showing how the insect's name is accurate, based on what you have seen as variations among the 12 specimens. PRODUCT: Chart and Paragraph	1. Find a book that tells about Carolus Linnaeus. 2. Collect enough information about him to answer the 5 W's, (Who, When, Where, What, and Why he did what he did) and 1 H (How he did it). 3. Use Linnaeus's system to classify an animal of your choice.	1. Compare a "numerical taxonomy" OR "cladistics" OR "Evaluhonary Systematics" system to the traditional taxonomy. 2. Reclassify your animal with the new system. 3. Which system works better and why? 4. If you don't like either taxonomy system, create your own system and compare with one of the other systems you have researched. Is your system the best? Why or why not?	
Classification of Life I. Ref. "Popular Science Enc." 3-513-17 II. Lab Aids Kits (#50 & #51) III. Projected learning programs inc. Page 19 (Software Catalog)	Ask "analysis" or extension question about article. Develop a system for classification of non-living things (or for items found in room or backyard). How does this system match what read about in chapter.	Do experiment. Write up experiment in good lab sheet style. (give them a form to use, etc.) Rather than a summary.	"Organisms Classification Key" software Are there some extension ideas in the software documentation?	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Heredity

TEACHER: George Johnson
SCHOOL: Orono Middle School

GRADE: 7

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
I. Library II. Lab-aids (kits) Cat. NO. 70, page 28 III. Popular Science PP 504-507	Select a human trait such as eye or hair color, ear lobe, hair on middle segment of fingers and illustrate what Mendel's Laws taught us about inheritance of that trait. Be sure to describe what the dominant and recessive phenotypes as well as genotypes for that trait are when you develop your explanation.	Genetic concepts Kit. (Use after chapter has been read) May demonstrate to class.	Select one "product" that might be formed by genetic engineering. Develop a T chart to evaluate it. Advantages Disadvantages	
I. Ecology packet card #2 II. Lab-aids (kits) Cat. NO. 71 page 291	Draw conclusions about your data. 1. Was this a "typical month. (find out) 2. What factors might cause #'s of births and deaths to change. List as many as you can and rank them in order of importance.	The molecular model of DNA (set up explain) Use after DNA has been studied) May involve class.	Read one magazine article praising and one article criticizing development of new strains of DNA. Which article seemed to have the strongest, most logical argument? Which was most persuasive (appealed most to your emotions)?	
I. Popular Science Chapter 3, page 458	1. Compare meiosis and mitosis. Use a visual explanation. 2. Review genetic diseases (name several)		Draw diagrams to scale of major physical changes in humans over the last 1000 years. Make your last diagram a picture 1000 years from now. Be sure to explain Why each of these changes has happened and what will happen in the next 1000 years to make the future person look like he/she does!	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Characteristics of Life

TEACHER: George Johnson
SCHOOL: Orono Middle School

GRADE: 7

CONTENT	PROCESS I FLUENCY	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Organization Living-Nonliving (p. 40, Zoo)	Read: "Einstein Anderson, Science Sleuth," by Simon, Seymour, 1980. Uses science to solve ten mysteries.	List differences and likenesses between living and nonliving materials (use the future wheel).	You produce a new plant. It uses energy and responds to stimuli, but does not reproduce or grow. Is it alive as we define life. Explain.	Draw a diagram, show-write, what it takes for something to be alive.
Principles of Science (p. 6, Zoo)	Re-enact some of Life Sciences history of the last 200 years.	Describe some of the artificial life forms that appear in science-fiction books, TV, and movies.	Create your own "New Lifes Being." (How will human life look 2000 years from now?)	
Biogenesis (Life comes from life.)				
References	1. Zoology, pp. 4-147	L.S. White, p. 60	L.S. White, p. 60	
Energy	Review the first and second laws of thermodynamics and relate how this applies to energy and life.	Obtain a small prayer plant and set up experiments to test its response to the stimulus of light. Exp. always dark, always light, etc.	Prepare article for science magazine. Describe the progress being made in the development of bionics--artificial electronic body parts.	Compare the energy released during respiration by a human and another larger animal (whale, elephant, etc.).

ENRICHMENT ACTIVITY MATRIX

TOPIC: Unit 1 - Studying the Earth
Modern Earth Science - Holt (1989)

TEACHER: Vernon Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 1 Introduction to Earth Science	1. Diagram and explain the Doppler Effect. 2. Imagine you are on another planet in a galaxy far from earth. If you used a spectroscope to examine the spectrum of the sun, would you expect the red shift, blue shift, or no shift at all? Why?	1. Make a list of scientific fields" related to earth science and explain each. 2. Explain the "Big Bang" theory. How might scientists determine that it probably took place 17 billion years ago.	Find information about three recent technological developments in three different branches of science. Write a short essay explaining the possible impact each development will have on the study of earth science.	Find out about organizations in your community that are working to protect the environment. Write a short profile describing the work of each organization. Assemble the information in a directory.
Chapter 2 The Earth in Space	1. Develop models to represent the earth's size, shape, and surface. 2. Is a hard-boiled egg a good model of the earth's layers? Why or why not?	1. Explain biological clocks and their function. What impact does this have on travel? 2. Explain how information is obtained to get information about the structure of the earth's interior.	1. Use the scientific method to show why the dust cloud hypothesis is accepted. 2. Construct a seismograph.	1. Gather information about the Metesosat weather satellite. Write an article describing the satellite and its uses. 2. Research seismic topography and write a report on its uses.
Chapter 3 Models of the Earth	1. Describe the earth's motions using observations of the sun and stars. 2. One expedition is preparing to explore the South Pole; one to explore the equator. To which expedition would you recommend the Mercator projection. Explain why.	1. Develop models to represent the earth's size, shape, and surface. 2. How could you use contour lines on a topographic map to help you locate the source of a river?	Use the library to research a report on the use of side-looking imaging radar (also called synthetic-aperture radar), the technologically advanced form of radar is used for topographic mapping.	Do some research on navigation devices such as the sextant and octant. Make a diagram explaining how these devices could be used to determine latitude.

ENRICHMENT ACTIVITY MATRIX

TOPIC: A Unique Planet
Chapter 2 in Text

TEACHER: Vernon Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Origin of the Earth	Use present observations of the solar system to explain how it began.	Develop a hypothesis that explains present observations of the solar system and how it began.	Use scientific method to why the dust cloud hypothesis is accepted.	
Birth of a Planet	Explain how information about the inside of the earth is obtained.	Discuss the difficulty of obtaining direct evidence of the earth's interior.	Construct a seismograph.	
Models of the Earth		Discuss the need for having different models.	Develop models to represent the earth's size, shape, and surface.	
Positions on the Earth's Surface	Have students measure latitude and longitude using minutes and seconds.	Have students read different kinds of maps and give the function of each map.		
Motion of the Earth	Describe the earth's motions using observations of the sun and stars.		Using a globe and a light source, show how the length of day and the seasons would change if the earth's axis were changed.	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Plate Tectonics
Chapter 3 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Moving Continents	A crustal plate moves an average of 5 cm. a year. How far will the crustal plate move in : a) 5 years b) 50 years c) 100 years d) 1000 years e) 1 million yrs	Make a map of what the world will look like millions of years from now.	Tell where your home will be on the earth a million years from now.	
Action at the Plate Edges		Discuss how the faults, volcanic islands, mountain ranges, trenches, and continental growth relate to moving plates.		If the sea floor is spreading at the mid-ocean ridge, does this mean the earth is getting larger. Explain.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Unit 2 - The Dynamic Earth
Text - Modern Earth Science - Holt (1989)

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 4 1. Plate Tectonics	A crustal plate moves 4 cm. a year. How far will the plate move in : a) 50 years b) 5 years c) 100 years d) 1000 years e) 1 million years	Explain the role of technology in the progression of continental drift hypothesis to the theory of continental drift.	Plate Tectonics is a relatively new theory. Conduct library research to find out how scientists accounted for continental land mass changes before thee introduction of plate tectonics. Report your findings.	If the sea floor is spreading at the mid-ocean ridge, does this mean the earth is getting larger? Explain.
Chapter 5 2. Deformation of the Crust	Using modeling clay to represent crustal rock formation, create examples of rock subjected to forces of compression, tension and shearing.	Suppose a proposed road construction would intersect a transform-fault boundary. What would happen to the highway if a strike-slip fault occurred? Why?	Devise a laboratory activity that will demonstrate isostatic adjustment. Include written directions. Ask a classmate to try your activity.	Why do you suppose dome mountains do not become volcanic mountains? Diagram and/or explain.
Chapter 6 3. Earthquakes	Find out how and why the worldwide network of seisomograph stations was formed and how they work together.	Construct a map showing the location of major earthquakes. Give an analysis of your findings.	Two cities are struck by earthquakes. The cities are the same size and built on the same type of ground. One city measures 4 on the Richter scale and damages are $1 million. The other measures 6 on the scale and $50 million in damage. Explain.	Research major earthquake activity along the San Andreas Fault over the last 5 years or so. Write a brief report on your findings.
Chapter 7 4. Volcanoes	While exploring a volcano that has been dormant, you notice volcanic ash first and lapillus later. Are you more likely moving toward or away from the volcanic opening. Explain your answer.	Can you assume that every mountain located along the edge of a continent is of volcanic origin? Explain why or why not. Explain by writing a critique.	Research major volcanic activity (like Mt. St. Helen's) in the U.S. during the past five years or so. If possible collect photographs, diagrams, etc. Write a report on your findings.	Evaluate some possible jobs one could pursue in these areas such as geological technician, mineralogist, volcanologist, etc.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Building the Crust
Chapter 4 in Text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	**PROCESS I** APPLICATION	**PROCESS II** ANALYSIS	**PROCESS III** SYNTHESIS	**PROCESS IV** EVALUATION
Earthquakes	Given necessary data, determine the location of an earthquake such as laboratory for Chapter 4 "Locating an Earthquake."	Construct a map showing the location of major earthquakes.		
Volcanoes	Compare and contrast the different ways in which a cinder cone, a composite volcano, and a shield volcano form.	Make a chart showing and explaining how the three main types of volcanoes form.	Discuss mid-ocean ridges and how they are formed. How would they differ from a volcanic mountain on land?	
Building the land	Using vocabulary, have students make crossword puzzles.		Have students research careers in geology and related field.	Evaluate some possible jobs one could pursue in these areas, such as: geological technician, surveyor, mineralogist, etc.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Weathering and Erosion
Chapter 5 in Text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Weathering and Erosion	Use some local examples to discuss the differences between weathering and erosion. Use pictures or drawings.	1) Discuss the processes of: a) mechanical weathering b) chemical weathering	Collect some objects that show weathering. Discuss their processes.	Look around your neighborhood for examples of erosion and weathering. List in table form, identify each example as physical weathering, chemical weathering, or erosion. Describe how erosion occurred.
Water on the Land	Demonstrate the water cycle by heating water in a beaker. Place above the beaker a flask containing cold water.		Discuss the origin of the water in the school or home and where the water will go after being used.	As a hydrologist, discuss the "things" that you might do on your job.
Water Beneath the Land	Demonstrate the water cycle by heating water in a beaker. Place below the beaker a flask containing cold water.	Set up experiments with different types of soil to show: porosity and permeability.	Discuss factors that affect the height of the water table and how this affects the depth of many wells.	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Wind and Waves
Chapter 6 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Glacial Ice	Classify glacial features into two groups: valley and continental glaciers.	Find out what glaciers covered the North American continent during the last ice age.		
Wind and Waves	Classify the erosional features and depositional features into two groups: wind and waves.	Find examples of erosion by ice, wind, or waves near where you live. Describe how the erosion is taking place. Explain what is being done about it.	Research the cause of "dust bowl" of the 1930's and what can be done to prevent another one from occurring.	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Earth's History
Chapter 7 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
The Rock Record	Collect some fossils (or use a fossil collection). Identify the fossil.	Try to determine when the fossil could have lived. What was the environment like when and where it lived? Is it still living today?	Describe how a leaf falling from a tree could become a fossil.	What is the geologic column? How are ages of fossils determined?
The Record of Past Life	Select a fossil from the past. Make a picture of the environment it lived in. Tell what you can about this fossil.	List the different kinds of fossils and how they are formed.	Discuss the limitation of fossils as a complete record of life.	Make a list of "jobs" (careers) you could have in these areas and briefly describe each.
Age of Rocks	Write a list of radioactive substances and give their half-lives.		Calculate the exact age of some rocks using the given half-life of various radioactive substances.	Describe what a half-life is and how it can be used.
An Earth Calendar	Write a list of all living things in your home. From this list, make another list of those which could become fossils. Is this list smaller? Why?	Is your fossil list from Process I similar to the fossil list of living things one million years ago?	Reduce the geologic time scale to one year. (or to a 24 hour clock)	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Unit 3 - Composition of the Earth
Text - Modern Earth Science - Holt (1989)

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 8 Earth Chemistry	List at least five common elements that you come across each day. Describe the form in which you find each - include the symbol of each element.	Choose one of the elements that is abundant in the earth's crust. Prepare a report on its physical and chemical properties and also its economic importance.	Using the Periodic Table, diagram, and describe the structure of several different elements.	Using the library to research some common forms of air and water pollution. Find out the sources of the pollution and find out what lawmakers are doing to control these forms of pollution.
Chapter 9 Minerals of the Earth's Crust	A mineral has a mass of 51 g. and a volume of 15 cm^3. What is the density of this mineral? Can you name this mineral? If not, what additional information is needed?	1) Develop you own scratch test (hardness test) using Moh's scale of hardness for a standard. 2) Using identification techniques, identify mineral samples.	1) Grow crystals, use a reference book for information. 2) Collect several rock samples. Examine them for visible crystals. Identify the crystal type.	1) Using the computer, design a keying system from which minerals can be identified. 2) Find out what minerals are common in the U.S. List these. Present findings to the class.
Chapter 10 Rocks	From a set of known igneous, sedimentary and metamorphic rocks, learn the names and identify at least ten from each set.	1) Collect at least 12 rocks from around here. Name and classify them. 2) Make a clay cross-sectional model showing a batholith, a laccolith, a dike, a stock.	1) Develop a rock classfication and identification guide. 2) Make a list of rocks you find in Minnesota. Present your findings to the class.	Using a computer, design a keying system from which rocks can be identified.
Chapter 11 Resources and Energy	Choose one important mineral and research its various uses. Present your findings to the class in a chart. Indicate the original ore, the mineral extracted from it and a number of uses of the mineral.	Research the effects of automobile fuel on the quality of air. Report your findings to the class.	1) Make a functional solar collector. Demonstrate and explain to the class. 2) Research a typical nuclear power plant. Draw a large digram showing major parts. Present your diagram to the class.	1) Imagine you are on a committee to reduce air pollution in Mpls/St. Paul. Would you recommend the use of high-sulfur coal as a fuel? Why? 2) Imagine your senator is thinking of proposing a bill which would cut off funding for a nuclear fusion research program. What might you say to agree with the Senator?

ENRICHMENT ACTIVITY MATRIX

TOPIC: Minerals
Chapter 8 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Atoms, elements, and compounds		Grow crystals. Use a reference book for information on growing crystals.	Have students describe the structure of different atoms using the Periodic Table.	
Earth materials -- minerals and rocks		Contrast rocks and minerals in their make-up.		
Mineral properties	Using identification techniques, have students identify mineral samples in class.	Have student develop own scratch test (hardness test) using Moh's Scale of Hardness for a standard.		Using a computer, have students design a keying system from which minerals can be identified.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Rocks
Chapter 9 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Magma and igneous rocks The three groups	Describe the relationship between crystal size and rate of cooling in igneous rocks.	From a set of known igneous rocks, have the student learn the names of at least 10 specimens.	Using a sample of rocks (igneous, sedimentary, or metamorphic), relate its underlying structure to human personality.	
Sediments Formation of sediments and rock	Find examples of sedimentary rocks as they are used in your own community. read book by Edward Galled called *City Rocks, City Blocks, and the Moon*	From a set of known sedimentary rocks, have the student learn the names of at least ten different specimens.	Discuss the formation and geological importance of sedimentary rocks.	
Metamorphic Changed rocks		From a set of known metamorphic rocks, have the student learn the names of at least ten different specimens.	Discuss formation of metamorphic rocks.	
The rock cycle	Given a set of 20 rock samples have students classify them as igneous, sedimentary, or metamorphic.	Develop a rock classification guide from the given set of 20 rocks for other students to use in identifying the rocks. See Fish-Game in "Dissection" unit of Omnibus as sample for how to do it.	Have the student collect at least 12 different rock specimens, naming and classifying each one.	Using the computer, have student design a keying system from which rocks can be identified.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Earth Resources
Chapter 10 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
People and Resources		Discuss recycling with a number of people. Find out what materials are being recycled. Make a list of some others that could be.	Relate population, pollution, and natural resources.	
Mineral Resources	Make a list of different ores and the mineral that is refined.	Discuss how long it has taken for mineral deposits to form and how this relates to conservation and recycling.	Describe how mineral deposits form and why it is necessary to conserve our mineral resources.	Take any natural mineral ore and describe the refining from an ore to a finished product.
Water Resources		Discuss the causes of water pollution and ways of protecting the water supply.	Go to your local water supplier. Find out where the water comes from and what is being done to purify it for your use. Do they have a plan to prevent pollution and how?	
Nonrenewable Energy Resources	Make a list of non-renewable energy resources.	Discuss the problems of using non-renewable resources such as fossil fuels.	Write to the "U.S. Committee for Energy Awareness, P.O. Box 37012, Wash. D.C. 20013" or to your local member of	
Renewable Energy Resources	Make a list or renewable energy resources and how they could be used for energy sources.	Discuss the value of using renewable energy instead of non-renewable sources.	congress and ask to be sent the most recent update on "Energy Projects to the yar 2000." They will also send you the most recent information on alternative energy sources. Bring the information to school and discuss with the cluster group (and possibly class)	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Air
Chapter 11 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Composition of the Earth's Atmosphere	Discuss the relative amounts and properties of each of the gases in the air.	Find out all you can about "air pollution" and its impact upon us.	Find out all you can about the "ozone" layer. What is happening to it? What causes it? What can we do? What will happen?	Find out all you can about "acid rain" and its impact on the earth.
Atmospheric Pressure and Temperature	What happens to atmospheric pressure as you go up from sea level. Make a graph showing atmospheric pressure from sea level on up.	Discuss the reasons for the changing temperatures in the various layers of the earth's atmosphere.	Find a radio station that you receive at night but not in the daytime. Make a graph showing day and night reception. Explain why.	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Unit 4 - Reshaping the Crust
Text - Modern Earth Science - Holt (1989)

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 12 Weathering and Erosion	Use some local examples to discuss the differences between weathering and erosion. Use pictures, drawings, models, articles, etc.	1) Discuss the processes of: a) mechanical weathering b) chemical weathering 2) What climatic factors influence weathering and the rate of weathering?	1) Collect some objects that show weathering. Discuss their processes. Pictures are often helpful too. 2) Diagram or make a model of a mature soil profile. Discuss the development of each profile and how soil and climate are related. Present to class.	1) Look around your neighborhood for examples of erosion and weathering. List in table form, identify each example as physical or chemical. 2) If you were a hydrologist, discuss what kind of work you might do in this field.
Chapter 13 Water and Erosion	Demonstrate the water cycle by boiling water in a beaker. Above the beaker, place a flask containing cold water. Explain to class.	If you were picking a material to make an artificial levee, what are the main characteristics you would look for?	Name and research the three types of stream loads. What impact would the loads have on life in the river and near the river.	Do some research in your community to find out the average precipitation, the amount of water lost to evapotranspiration run off into streams and how much becomes groundwater. How does the water budget change with the seasons. Report this to class.
Chapter 14 Groundwater and Erosion	Demonstrate: porosity, permeability, and water holding capacity. Explain to class (or construct models.)	Diagram and explain how these are formed: caves, caverns, stalactites, stalagmites, karst, topography. Report to class.	Describe the rock layers in an artesian formation. Make a model if you like.	Discuss and/or diagram the difference between a "spring" and an artesian well.
Chapter 15 Glaciers and Erosion	Make a list of glacial features and explain them to the class.	Make a list of glacial features you can observe around here. Explain to the class how they may have formed.	Make a model of glacial landscapes and their features (crete, cirque, horns, tarns, hanging valley, u-shaped valley, etc.)	Research theories to account for ice ages. Report these to the class.
Chapter 16 Erosion by Wind and Waves	Compare the composition and shape of sand dunes and loess deposits. Make models or charts.	Suppose scientists have been observing that the size of sand bars in a particular area are decreasing over the past five years. Explain what this suggests about the climate of the area. Why?	Find examples of erosion by ice, wind, or waves near where you live. Describe how the erosion is taking place. Report to the class.	Research the "Dust Bowl" of the 1930's and its probable causes. What can be done to prevent another one from occurring? Report to class.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Energy and Water in Air
Chapter 12 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Atmospheric energy	Discuss the result of the Coriolis effect on aircraft flying north or south.	Compare the placement of air conditioners near the ceiling with the placement of heaters which are usually near the floor.	Make a cloud chart showing the types of clouds and how they affect the weather.	Research the "Weather Bureau" and how it predicts weather. OR Research how you can predict the weather on a daily basis.
Water enters the Air	Calculate the relative humidity. Do the laboratory activity "Dew Point and Relative Humidity"	Do the Enrichment activity "Environmental Changes"	In winter the weather services give us a "chill factor." In summer they often include the humidity in the temperature. Find out how these temperatures are determined.	Why does fog form after clear nights more often than after cloudy nights?

ENRICHMENT ACTIVITY MATRIX

TOPIC: Weather
Chapter 13 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Water leaves the air	Calculate cloud heights for different days, using the method shown in the investigation page 357. Use a sling psychrometer for more accuracy.			See Matrix for Chapter 12.
Air masses	Use a weather map to show locations and movements of the different air masses and to predict weather.	Use the information about air masses that are common to this area and the general patterns to explain why do we have the kind of weather in summer and winter. Write a report describing the reasons for your explanation.		
Weather changes	Lab - cloud formation - see prepared handout.	Discuss why tornadoes and hurricanes occur frequently in certain areas.	Make a daily observation of the atmosphere for a week. Note, by name, the kinds of clouds present, whether there is rain, snow, smog, or fog associated with the clouds, and any other events that might have occurred during the week. Report your results.	
Predicting weather	Lab - Isobaric Weather Map. See prepared handout.	Cut out the weather map from a newspaper for a week. Discuss any weather changes or patterns and make forecasts based on the maps.		See Matrix for Chapter 12.

ENRICHMENT ACTIVITY MATRIX

TOPIC: The Oceans
Chapter 14 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
The Earth hidden beneath the Sea.	Compare the ocean floor features and land features. How are they similar? Why? How are they different? Why?	Prepare a poster showing the kinds of studies an oceanographer might do.	Do the enrichment activity "Changing Sea Levels."	Write a paper discussing why there are so many coral reefs especially around the equator in the Pacific Ocean.
Air masses	Prepare a poster that shows the kinds of features and materials found on the ocean floor.	Interpret the history of sea floor sediments using diagrams of core samples.	Do the laboratory "Profile by depth sounding."	Research: Life has been found in deep ocean trenches. Find out what kind of life and how it can exist without green plants as a source of energy, such as life in and around "vents."

ENRICHMENT ACTIVITY MATRIX

TOPIC: Water in the Oceans
Chapter 15 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Sea Water	Do a lab as directed in lab "The composition of sea water."		Do written report on resources obtained from the ocean. Classify as food, mineral, or energy.	Research some (or one) careers in oceanography in depth such as the coast guard, technical writer, biologist, etc.
Resources from the Sea.	In some places, sea farming is used in a variety of ways. Find out about this and report to the class.	In 1984, many krill usually present in Antarctic water disappeared. Find out why and what effect this would have on sea life.	Give an oral or written report on protecting resources obtained from the ocean.	Find out how aluminum is "mined" from the ocean and its refining process. You can do this with oil or any other product obtained from the ocean, such as salt.

ENRICHMENT ACTIVITY MATRIX

TOPIC: The Motions of the Sea
Chapter 16 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Underwater currents	Do laboratory "Density Currents"		Research upwellings and why they are important for sea life and food.	
Surface currents	If oceans did not circulate, what would be the effect on climates near the poles and near the equator? Diagram, explain, etc.	Obtain brochures from travel agencies that describe beaches, such as of the Bahamas, Florida, California, etc.	Explain how the "El Nino" may affect climate and air temperature on the West Coast of the United States.	
Waves	Set up a "wave tank" and perform some experiments. Record results and explain.	Compare different waves by their height, wave length and frequency.		
Giant Waves	Predict the times of tides from a position of the sun, earth and moon.			

ENRICHMENT ACTIVITY MATRIX

TOPIC: Unit 5 - The History of the Earth
Text - Modern Earth Science - Holt (1989)

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 17 The Rock Record	1) Make some models with clay on: unconformity, etc. 2) Collect some fossils and identify them. 3) Write a description of what igneous, sedimentary and metamorphic people would be like.	Find information about how moon rocks have been dated and what information was obtained by studying them. Write a report and give and report on this to the class.	1) Describe what a half-life is and how it can be used. 2) Make a list of radioactive elements and their half-life. 3) What impact would the discovery of a "living rock" have? Use your imagination and write a report.	Examine an exposed area of sedimentary rock in your community. Sketch your findings. Write a report based on the evidence of the formation and about the history of the rock bed.
Chapter 18 A View of the Earth's Past	If you found a rock layer containing dinosaur fossils, what assumptions would you make about the age of the rock layer?	There are deposits of iron ore in northern Minnesota. During which geologic era were these deposits probably formed? Explain your answer and how the deposits of iron were probably formed. Report to class. (Make a written report)	1) Reduce the geologic time scale to one year (or to a 24 hour clock). 2) If you were a molecule of water, write a report on your experiences and the place you could have been for the past 200 million years.	1) Research the discoveries made by British anthropologist, Dr. Louis S.B. Leakey and Mary Leakey in Olduvai Gorge in Tanzania, Africa. Write a report and give an oral report to the class. 2) Make a list of "careers" you could have in these areas and briefly describe each.
Chapter 19 The History of the Continents	Two hundred million years from now the continents will all have drifted to new locations. How might these changes affect life on the planet Earth?	Shields provide the nucleus around which most continents have formed. Do research to find the name of each known shield as well as the location on each continent; also how does the term "Continental nucleus" apply to shields?	Paleontologists have found traces of Homo sapiens in the Grand Canyon. Do research and write a report about the earliest human inhabitants of the Grand Canyon.	The Grand Canyon in Arizona and the Zion and Bryce canyons in Utah are on the Colorado Plateau. Do research in a library to find out what geologic periods are represented by rocks in each canyon. Draw a time line which shows the periods during which the rocks in each of the canyons were formed.

ENRICHMENT ACTIVITY MATRIX

TOPIC: The Sun
Chapter 17 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Structure of the Sun	Plot the sunspot cycles as directed in the enrichment activity handout for this chapter.	Do a report on how sunspots can affect the earth.	"Motion Around the Sun." Do the laboratory exercise handout or No. 1 of "Applying Science" on page 479.	
The Sun's Energy	Do "compute!" on pages 476- 477 of text. Use the chart that goes with this program	Calculate the wave length of your favorite radio station. See #4 in "Applying Science" on page 479.	Do a library report on fusion.	Look up Einstein's theory of relativity and explain it.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Satellites of the Sun
Chapter 18 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
The Inner Planets	Compare and contrast the inner planets.	Construct a scale model of the planets' size and their distance from the sun.	Discuss how the conditions on Venus could occur on earth.	
The Outer Planets	1. Compare and contrast the outer planets. 2. Compare similarities and differences of the inner and outer planets.	Make a chart showing the elements that make up each planet -- both inner planets and outer planets.	Discuss the pros and cons for spending money on exploring the solar system.	
Small members of the Solar System	Have students research superstitions on phases, e.g., full harvest, hunter's and planter's moon (or any other superstitions.)	Discuss the possibility of the asteroids once being part of a planet.	Have students research and report on the cort cloud. Do a research paper on comets.	
The Earth and Moon	Have students make diagrams showing how phases and eclipses occur.	Compare the conditions on the moon with those on the earth.	Make a list of things necessary for you to live on the moon. Discuss this possibility.	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Stars and Galaxies
Chapter 19 in text

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Observing Stars	Learn how to use a starfinder. Relate this to some night time observations.	Look in a newspaper, an almanac, or sky and telescope magazine to find out which planets are visible. Locate one of them in the night sky and view it for several nights. Explain how you know it to be a planet.	Using the computer program on page 542 & 543, compute the distance of various stars such as: Sirius, Rigel, Alpha, Centuri, Altair, Barnard's Star, Procyon, Wolf 359, Beta Cassiopeia.	
The Life of a Star	Research unusual stars such as neutron stars, black holes, quasars, etc.	Do the "Enrichment" handout "The Hertzsprung-Russell" diagram.	Find out how old our sun is and about how long it will live.	
Galaxies	Study the size and origin of the universe.	Explain the different kinds of galaxies and how they are classified.	Find out what you can about such phenomena as: Black holes, Quasars, supernovas, etc. Be innovative. Find some of your own.	

ENRICHMENT ACTIVITY MATRIX

TOPIC: Unit 6 - Oceans
Text - Modern Earth Science - Holt (1989)

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 20 The Ocean Basins	Compare the ocean floor features and land features. How are they similar? Why? How are they different? Why?	1) Prepare a poster showing the kinds of studies an oceanographer might do. 2) Prepare a poster that shows the kinds of features and materials found on the ocean floor. 3) Write a paper discussing why there are so many coral reefs around the equatorial area in the Pacific Ocean.	1) Interpret the history of sea floor sediments using diagrams of core samples. 2) Use modeling clay to prepare a model of continental margins. Include these features: a continental shelf, slope, and rise. Add a submarine canyon and trench in appropriate places.	Prepare a report on the different types of submersibles. Your report should include special features of each type of submersible and how each has contributed to oceanographers' knowledge and information about the sea.
Chapter 21 Ocean Water	1) Prepare an illustrated report on zooplankton and phytoplankton. Describe several types of each including descriptions and drawings of each. 2) Prepare a report on resource obtained from the ocean. Classify as food, mineral, and energy.	Look up information about intertidal zones. Write a detailed description of a typical intertidal marine community. Include plants and animals that are a part of this community and how they survive in this difficult environment.	Research pollution of North American costal waters. Make a chart which shows how a sample food chain is affected by lead pollution; also trace the impact of at least two other pollutants on a food chain.	1) Research: Life has been found in deep ocean trenches. Find out what kind of life and how it can exist without green plants as a source of energy. 2) Research the new foods being produced through aquaculture. Include nutritional value, a world map showing the countries developing aquaculture.
Chapter 22	1) If oceans did not circulate, what would be the effect on climates near the poles and near the equator? 2) Compare different waves by their height, wave length and frequency.	1) Predict the times of tides from the position of the sun, moon, and earth. Use diagram. 2) Diagram circulation patterns of ocean currents and explain why their circulation pattern is as it is.	1) Research: Diagram and explain how energy can be harnessed from the oceans. 2) Research: Upwellings and why they are important for sealife.	1) Explain how the El Nino may affect climate and air temperature on the West Coast of the U.S. 2) Obtain brochures from travel agencies that describe beaches, such as the Bahamas, Florida, California, etc. Explain why they are unique.

ENRICHMENT ACTIVITY MATRIX

TOPIC: Unit 7 - Atmospheric Forces
Text - Modern Earth Science - Holt (1989)

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 23 The Atmosphere	1) Make a graph showing atmospheric pressure from sea level on up. 2) Discuss the relative amounts and properties of each of the gases in the air.	Find out all you can about the "ozone" layer. What it is, what causes it, why we are concerned about it, etc.	1) Explain the "greenhouse effect," how it works and why we are concerned about it. 2) Find a radio station you receive at night but not during the day. Explain.	Contact your local Environmental Protection Agency (EPA) to find out what is being done in your area to control air pollution. Report your findings to the class and the impact of air pollution on us.
Chapter 24 Water in the Atmosphere	1) Make a "cloud" chart showing the types of clouds and how they affect the weather. 2) Why would polluted air more likely form clouds than clean air. Explain.	If you break a hailstone in half, you will see a layered texture. Explain why.	Research drought periods. What impact does it have on farming, plant life, animal life, recreation, people, etc.	1) Do research to find out about a region that has little precipitation. What impact does it have on vegetation, animal life, human survival, etc. 2) Research the other extreme.
Chapter 25 Weather	1) Explain the "wind chill" factor. 2) How does a bimetal thermometer work? 3) What is the coriolis effect? Explain the impact it has on us.	People on Vancouver Island, off the west coast of Canada, hear reports of a wave cyclone in Alaska. Is it likely that this will reach their area? Explain.	Cut out the weather map from the paper for a week. Trace the paths, fronts, etc. during that time. Explain why the weather was as it occurred. From the last map, make a prediction of the weather you will have for the next day or two.	1) If you were a meteorologist, what kind of work would you probably do? Research this career. 2) Try predicting weather. What information would you need to do this?
Chapter 26 Climate	Explain why we have blizzards, hailstorms, sever windstorms, tornadoes, etc. in our area.	With information that you have learned and from resource areas, draw a map showing variations in vegetation around the world. Include areas of little or no vegetation as well as various types of vegetation. Share your map with the class.	The Milankovitch theory states that a periodic change in the tilt of the earth's axis was a factor in causing ice ages. Use factors you know that affect climate to explain how this might have occurred.	1) What kind of weather and climate do you like? Research areas on our earth where you may find this "ideal" situation and explain. 2) What impact would deforestation of tropical rain forests probably have on our lives?

ENRICHMENT ACTIVITY MATRIX

TOPIC: Unit 8 - Studying Space
Text - Modern Earth Science - Holt (1989)

TEACHER: Mr. Linn
SCHOOL: Orono Middle School

GRADE: 8

CONTENT	PROCESS I APPLICATION	PROCESS II ANALYSIS	PROCESS III SYNTHESIS	PROCESS IV EVALUATION
Chapter 27 Stars and Galaxies	1) Learn how to use a star-finder. Relate this to some night time observations. 2) Explain what the "red shift" is and what it infers. What is the "blue shift?" The Doppler effect? 3) Explain the different kinds of galaxies and how they are classified.	1) What are some instruments that can be used to study astronomy. Explain. 2) Make a storyboard showing the development of the universe according to the "big bang" theory. 3) Make a report on the Milky Way galaxy.	In 1984, the star Beta Pictores came into prominance. Many scientists are linking this star with the formation of a new solar system. Research and report what you can find out about it.	In February 1987, astronomers saw a supernova explosion in the large magellanic cloud. Because Ian Dkelton was the first to notice it, the explosion is known as Skelton's Supernova. Write a report on Skelton and his historic discovery.
Chapter 28 The Sun	1) Describe, diagram, and/or explain the difference between fusion and fission. 2) Draw a diagram showing the activities that take place in the atmosphere of the sun.	Write an essay describing an imaginary trip to the center of the sun. Describe each layer and zone through which you would pass.	Research and report on the impact of solar flares on auroras, radio transmission, magnetosphere, magnetic storms, etc.	1) Look up Einstein's Theory of Relativity and explain it. 2) Explain and research how the atmosphere of the earth would be different if the earth had formed from a much larger protoplanet.
Chapter 29 The Solar System	1) Construct a three-dimensional scale model of the planets' size and their distance from the sun. 2) You are going to give a guided tour of the solar system out to Saturn and Jupiter. Explain what you would see, highlights, length of time of trip, etc.	1) Make a chart showing the elements that make up each planet. 2) Research the composition of asteroids, their existence, etc. 3) Explain the impact of these different polar orientations and tilt. a) vertical to our orbit plant, b) horizontal to the orbit plane, c) at a 45-degree tilt.	1) Have a panel to discuss the pros and cons for spending money to explore the solar system. 2) Research the "Cort Cloud" and give a report on it.	Talk with the director of a local planetarium or natural history museum about meteorites that have been found around this area. Find out as much as you can about their age, composition, etc., and classify them.
Chapter 30 Moons and Rings	Make models or draw diagrams showing phases of the moon as well as solar and lunar eclipses.	GOLD!! You have just discovered gold on the moon. Explain: a) How you would live on the moon? b) How you could "mine" the gold? c) How you would process and ship the gold?	Imagine that astronomers have discovered a planet that spins on its axis in 20 hours, and orbits the sun in 245 days and 4 hours. The planet has one moon that has a complete set of phases in 24 days and 10 hours. Design a calendar for this planet. Indicate days in a month, months in a year and how often leap year occurs.	Do research on how one or more of these ancient or traditional cultures explained solar eclipses: Chinese, Persian, Greek, Roman, Mayan, Sioux, Aboriginal, Tahitian.